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ABSTRACT

Edited proceedings from the Conference for Talent Development for Environmental Careers (Washington, DC, August 1979), focusing on pre-professional, environmental career experience programs for gifted elementary/secondary school students, are presented in this nine-section book. Each section includes a brief overview of the papers relating to the specific topic. The first section addresses the environmental crisis in education. Section 2 informs of efforts to create models of what environmental education should be and develop sets of materials helping to actualize ideal environmental education. Section 3 focuses on environmental career exploration and includes lists of resource materials. Section 4 discusses opportunities for minorities/women and programs for minority students. Activities of the Council of Environmental Quality and Environmental Protection Agency are described in section 5. Funding possibilities for environmental talent development are presented in section 6. Two papers and a panel presentation addressing gifted students are presented in section 7. Model field program activities are described in section 8 (including Stewardship Program--Nature Conservancy; Executive High School Internships; Audubon Naturalist Society Program; Noise Pollution Measurement; Youth Conservation Corps; Madeira School Co-Curriculum Program; Chesapeake Bay Foundation Program; and Smithsonian Institute's Chesapeake Bay Center for Environmental Studies). The last section discusses the failure of education in responding to environmental issues. (Author/JN)

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EDUCATION FOR TOMORROW'S ENVIRONMENT

The Edited Proceedings of a Conference Organized by the University of the District of Columbia with the Cooperation of the:

Center for Environmental Education,
National Audubon Society,
Partners for Livable Places, and
The American Forestry Association.

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PREFACE

by the editor, Herb Alf

The Conference for Talent Development for Environmental Careers convened in August, 1979, in Washington, D.C. The meetings focused on field program development of environmental career education for gifted students. The conference carried a sense of urgency for the development of optimal human resources for the new critical career work of environmental rescue. This journal is published to record and to extend the conference impact.

The Talent Development for Environmental Careers Conference was organized by educators and environmentalists whose exchange of views brought mutual recognition of: (1) the urgent need for reversing the escalating global ecological imbalance; (2) the need for challenging gifted students; and (3) the need to evoke an ethical consciousness of human and environmental interrelationship. These seemingly separate needs were found to carry excellent possibilities for cooperative solution if educators and environmentalists could use the resources of one another.

Clearly, optimal talent development of youth was needed for the vast ecological intervention necessary in redressment of the deteriorating world situation. Among the many scientific analyses of the environmental problems of our time, the Club of Rome had summed up in its 1972 report, ***Limits to Growth***: "We are unanimously convinced that rapid radical redressment of the present unbalanced and dangerously deteriorating world situation is the primary task facing humanity."

The deficit of talent harked back to the Sputnik crisis of the 60's when suddenly the United States was in a panic for talent to catch up with the Russians. The difference now was that the emergency was more profound: now there was a deficit of talent for coping with suicidal acceleration of injury to the ecosystem; and now there was

still no panic for improvement of education — people had apparently not yet registered the environmental trouble as a revelation of the crisis in their schools.

It was time for the various specialists of the educational-environmental domain to join in an examination of the crisis in terms of talent deficits revealed and school advances mandated. Since human beings were causing the crisis, it followed that a solution would have to include revision of the developmental program that yielded the problem values and behaviors. We had no comprehensive manual to offer those who would engage in such crucial curriculum revision, but we had the possibility of bringing together diverse, pertinent perspectives that could afford direction for these trail blazers.

While we weighed environmental needs, we also took note of educator reports of bright students who were more bored than challenged in school. Many such low-motivation students were reported to lack a sense of career direction. This was often intensified by the remoteness of students from locations that offered adequate career exploration experiences. The remoteness factor was known to be particularly limiting for gifted students with career potentials not likely to be challenged by local opportunities. New models of environmental career education needed to be developed for all students but in particular for gifted students. Thus we decided to focus the initial TDEC conference and publication of papers on pre-professional, environmental career experience programs for gifted students of elementary and secondary school years.

The rationale for this focus was based on studies indicating that a key component in the development of gifted creative problem solvers is the introduction of pre-professional career experience during elementary and secondary school years. Such career experience in the field was reported to strengthen motivation, direction, and a sense of destiny, all of which were attributes that research had significantly associated with the kind of highly gifted professionals that are needed for critical environmental careers.

In this publication we have brought together spokesmen for private and public resource agencies, career education, environmental education, gifted-student education, exemplary programs, and environmental action. Although the professionals of those categories have

had common concerns, until now they have not joined together in liaison to: (1) draw upon each other's resources; (2) address each other's needs; (3) learn from each other; and (4) effect imperative integrated advances. The method of our approach, of bringing together a wide range of groups, borrows from history's lessons of creative advances realized where merging streams brought tribes of different rivers into liaison.

There is good opportunity as well as cause for a TDEC thrust at this time in that new federal initiatives now encourage and judicial decisions require public schools to meet the special needs of every child. In this context there is increased funding for programs to better meet the needs of the gifted. And, most fortunately, there are many gifted students who, though possibly not adequately challenged in school today, are, nevertheless, anxious to find a career opportunity that challenges their potential and inspires a "sense of destiny" for their lives. It is our hope that this TDEC confluence of perspectives may inspire a flow of new programs to bring the resources of our most talented youth into the effort to rescue the global support environment.

A Sputnik kind of panic for talent is not yet apparent in the 80's. The calm itself is disquieting in face of the escalation of problems reported by environmental scientists. Our aim is not to provoke hysteria, but rather it is to assist the development of such human resources as best promise success in the *primary task facing humanity.*

For the human story of TDEC's history, I will start with myself. My field program work with the gifted in Washington Expeditions and my increasing awareness of the environmental crisis brought me to see Talent Development for Environmental Careers as a concern that needed to be acted upon. I shared my thoughts with some of my respected colleagues and received support and collaboration from them in this project.

From the University of the District of Columbia, I would especially acknowledge the contribution of Beverly Cassara, Irwin D. Gordy, Emma Head, Mary Jo Joseph, Allena D. Leonard, Thornell Page, Charles S. Williams, and Clara C. Wills; and from Howard University, I would acknowledge the contribution of Joan E. Gildemeister. TDEC became a University of the District of Columbia interdepartmental effort. It was a joint project of the Optimal Development

Program of the Department of Special Education, the Division of Continuing Education, the D.C. Cooperative Extension Service, and Graduate Studies.

The University component was joined by the Center for Environmental Education. Thomas B. Grooms, Executive Director, of CEE was a crucial contributor and organizer of environmentalist participation; Fran Swift, Communications Coordinator, also made an important contribution. Through CEE liaison with environmentalists, the National Audubon Society, Partners for Livable Places, and the American Forestry Association also officially supported TDEC as cooperating organizations.

Yet others, unassociated with the collaborating organizations, deserve mention for their important voluntary service: Susanne M. Fogleman, Lidia Landherr, and my sons Gregg, Todd, and Scott Alf. Lastly, I express my deep appreciation for the excellent editorial assistance of Denise Dickens.

The TDEC project has not been a funded program; it has grown from the work of volunteer organizers, participants, and presenters. The dedicated work spirit and powerful presentations of this conference have strengthened my belief that optimal human resource development now for environmental conservation is imperative for human survival into the future century.

Herb Alf, Ed.D.
Director, TDEC
University of the District of Columbia

Section I

ENVIRONMENTAL CRISIS IN EDUCATION

INTRODUCTION

by Herb Alf

The title of our first section of papers carries several assumptions: (1) it is an assumption to speak of crisis; (2) the crisis is assumed to be environmental; and (3) the environmental crisis is assumed to be a consequence of and/or to impact upon that process of developmental manipulations that we call education.

(1) By crisis, I mean a turning point of radical change in history, for better or worse, with an element of control still present. If the change were going to be imposed upon us by some natural event, as a planetary collision, for example, we would not use the term crisis, implying human decision at a turning point, but rather we would write of impending disaster. The word choice intends neither a pessimistic nor an optimistic description. It is a declaration of an exciting era in which what we do or do not do will make an irretrievable difference in the nature of the future.

(2) The assumption that there is an environmental crisis deserves more support than I can here provide. I must hope that the reader is already informed of the supporting evidence for this statement. It derives in part only from reports of:

(a) substance pollution of land, air, water, and food;
(b) hazards of radioactivity associated with nuclear waste, weapons, and harnessed chain reactions;
(c) global climate hazards induced by deforestation and changes in CO_2 and ozone levels;
(d) widespread effects of deforestation and agricultural land loss upon erosion, flora and fauna, and human life-support systems; and

(e) growing world population that has more than doubled since 1930.

As said, these problems are only a part of the basis for the word choice, crisis. What is most significant is not these present circumstances but the trend revealed in the reporting of these circumstances over recent years. Unfortunately, the global ecological imbalance is still escalating while the causative technology is both intensifying and spreading and the world population, that is escalating the technology, is still increasing, now reportedly exploding. It is the triple multiplier pattern of the escalation process that is most significant to our word choice, crisis.

The environmental crisis is assigned to education under the rationale that the circumstances that bring us to our present turning point have not been imposed upon us by a natural disaster but, rather, have been caused by human behavior. This being so, it follows that our chance of averting environmental disaster is rested in our ability to change human behavior. Two questions remain:

(a) In what ways has what we teach and/or what we do not teach brought about the behaviors that are causing our environmental crisis?

(b) What can we do in education at this time that will help develop the optimal human resources needed to effect a fortunate turn in human history.

These questions are concerns of this compendium but particularly the concern of the writers of this section. The three papers that speak to the subject come from outstanding authorities of three different perspectives. So that you may know these persons for the unique people they are, biographical descriptions are provided. They offer singular, profound, and yet complimentary perspectives. Together they establish a pattern for the mind of the reader to weave into his or her own design for action.

THE EQUILIBRIUM OF SURVIVAL

by Michael J. Cohen

Michael Cohen has a 28 year career in environmental and outdoor education. He is a product of the progressive camping movement having worked with Josh Lieberman at Camp Robinson Crusoe throughout the early 1950's. Mr. Cohen is a former director of the American Youth Hostels. He and his wife now co-direct the Expedition Institute of the National Audubon Society, a travel-campout-study program. Mr. Cohen has documented this program in his books ACROSS THE RUNNING TIDE and OUR CLASSROOM IS WILD AMERICA.

Through binoculars, a pair of eyes eagerly scanned the gazelle herd and countryside. Were the reports true? Was the three-year-old boy who had been lost in the wilderness seven years ago still alive? Had he actually been found, nurtured and raised by a herd of gazelles?

Suddenly the observer spotted what he had come so many miles to see. He wrote, "from one of the bushes a slender white forms springs, a gazelle which immediately begins to pull up ball-shaped roots of dhanoun — the desert's principal survival food. Suddenly, I see blue flashes against jet-black hair, as a child with a bronzed and slender body darts from the same bush, throws himself at the unearthed roots, teeth first, peels them with clicks of his tongue, then cuts them up frantically with his incisors.

"My gazelle-boy makes for a seeping rock, sucks in the hesitant drops and then laps up those which fall, with a long pause between each drop as if to savour its taste. With a few leaps, the child heads

for another corner of his oasis. I watch him sniffing almost incessantly, his neck stretched, his face to the wind, his nose continually jerking in little convulsive movements, his herd following behind him or leading him in turn. He also sniffs the flanks of his animals, springs of brushwood, bits of thornbush, flowers, berries, fallen dates, balls of dung, traces of urine. Dare I add that his nose also finds its way to his animals' hindquarters?"

Clearly, gazelle-boy would be considered a severely misguided and disturbed youth if he entered our society and his peer group. Admittedly, he's a complete dropout, probably has an IQ of zero with SATs and Achievements to match. He exhibits most of the immoral, uncivilized behavior and attitudes known to man; a dirty, rude, nude who might bite old ladies or pee in the grand piano; truly a candidate for a padded cell or a cage at the local zoo. His only claim to fame might be that he did survive. He learned to survive in the natural world.Think about that, will you? Could you or I do that? Could we do it at the age of three years old?

Perhaps we should reconsider gazelle-boy. Survival! That's something we could afford to learn from him, correct? A handy piece of knowledge to have around just to prevent minor mishaps such as Three Mile Island and the like. After all, why bother learning anything else if we're not going to be able to survive?

Let's use gazelle-boy as a model. Let's have him teach us "survival," beginning with rooting. "He throws himself at the unearthed roots, teeth first, peels them with clicks of his toungue, then cuts them up frantically with his incisors." That was an important part of survival, right?

Our first step will be to get rooting introduced into the public school curriculum. What will the school board, the superintendent, principal, NEA, teachers and their union, as well as education experts contribute to make the learning of rooting possible? Will we have special classes for the gifted? Will they be permitted to learn rooting experientially while the non-gifted be required to read and write about it? How will special education teachers approach rooting? Is it a ritual in some remote religion and therefore unacceptable for education as part of the recognized separation of church and state? Realistically, could we actually get kids in school to learn rooting even if we tried?

Absurd? Of course! But survival can be learned. Gazelle-boy successfully learned it, and he did it without any help from the paraphernalia and personnel which we call our "educational system." How could he? He must have had a marvelous teacher. He did. It was his environment. His environment was his educator.

So there you have it. Although we seldom recognize it as such, the environment is an incredibly successful teacher. It taught a human being to be a gazelle, a superhuman educational feat. It also taught us to be us. The only difference is that our environment is different from the environment of gazelle-boy.

Studies have conclusively shown that the average American spends over 95% of his or her life indoors[3]: inside houses, cars, schoolrooms, offices and bathrooms, inside the minor and major fortresses we have created to protect ourselves from the elements and wonders of nature, including other human beings. The indoor environment has powerfully conditioned us to it, conditioned us to our man-made world as stringently as gazelle-boy was conditioned to the environment of the natural world. On many levels we know as little about relating to nature as gazelle-boy knows about driving a car. That's something to keep in mind as we make our decisions about how to exploit the natural world in order to maintain our standard of living. I mean, would you trust gazelle-boy to design and operate a corporate farm, O'Hare International Airport or Con-Edison? Just how much respect would you have for our economic and political leaders if you thought they belonged in the zoo? Isn't that how nature perceives them?

Let me specifically give you an example of the human condition. "The expedition was visiting the Louis Leakey Archaeological Site in Calico, California. The interpreter at the excavation explained how the various artifacts there were made. He demonstrated the use of a hammerstone to flake rocks and make a fist axe, and then invited the expedition members to try their hand at it. For two hours we used the rocks as hammers and pounded away at large pieces of chert until they assumed the shape of a fist axe or scraper. It was very exciting.

"That afternoon we traveled to Death Valley, arriving in a vicious dust storm. We decided to put up tents on the hard campsite ground and proceeded to do so. What followed was startling.

"In blinding, choking dust, coughing, with eyes tearing, sixteen students informally lined up and waited their turn to use the solitary hammer in the tool box in order to pound their tent stakes into the hard ground. They complained that we should have had many more hammers with us to cope with this kind of situation. There were rocks lying all around which could have easily served the same purpose. Only four hours earlier we had been using rocks as hammers. But the unconscious conditioning of our culture prevailed and the store bought, steel hammer was sought, even at the cost of extreme discomfort from the storm. Obviously, dependence upon technology was alive and well."[4]

Conclusions? Ours is that (1) a practically unrecognized equilibrium exists between any individual and his/her environment; (2) the environment is a powerful educational determination in the life of an individual; (3) if an individual wants to change, he must change his environment; and (4) if we are to survive, the deep, conditioned effects of our exposure to our man-made environment must be equalized and offset by potent education which takes place within the environment of our life support system, the natural world.

To these ends, the National Audubon Society has established an academically accredited program of expedition education which critically uses the American social and natural environment as a powerful experiential teacher.[5] Audubon's operation and effects over the years have led many of its participants, including myself, to deeply appreciate aspects of gazelle-boy's life which were previously hidden from us by the walls of indoor America. We've become aware that it was the natural environment which guided gazelle-boy into a self-sustaining, supportive, close knit community. We've come to realize that in that community each individual was an important, vital member of a team which achieved equilibrium, survival and integrity through mutually beneficial interactions between themselves and the natural world. That sounds like something desperately needed by all of us today, especially young people, if there is to be a tomorrow.

At Audubon, we're teaching interested students and adults how to realistically develop and integrate pertinent "gazelle values" into our present society and outlook. Audubon students are being trained to enter environmental education careers which in turn help others attain

environmental integrity. Students are assuming jobs and lifestyles which are not detrimental to the biosphere's ability to support life. They are establishing learning environments and attitudes which offset the effects of those individuals who have not yet come to grips with the urgent problem of our deteriorating life support system. Many of these exploiters believe we belong in the zoo. Their indoor conditioning has led them to feel threatened by the environmental equilibrium which William O. Douglas describes, "Man is whole when he is in tune with the winds, the stars and the hills as well as his neighbors."

Education doesn't look much like a school as we know it when the environment is being used as the teacher. For example, coursework is not artificially separated into unintegrated, scheduled subjects. It is instead an important part of the exciting experiences which routinely confront each expedition member. An archeologic dig becomes not only "anthropology," it is also physical education, reading, writing, and arithmetic as well as knowledge of the ecology of the period and involvement with the music and culture as it exists today.

A description written by Edward Stiles, staff writer for the Tucson Citizen, after a 3-day visit with the expedition clearly reveals many additional variances between the Audubon program and school as we know it:

The institute doesn't look much like a school. In fact it looks more like a backpaker's campsite, much too casual and fun for the often painful process of stuffing knowledge into the brain.

The whole thing becomes suspect when the 20 students, ranging from some in high school to others at the master's degree level, rave about how much fun they're having.

But it's hard to argue with the results. Many of the students go on to college after completing their junior year of high school, and the institute and graduates of the program say they're far ahead of their peers when they return to more traditional education settings.

One of the students explained, "If we want to study the desert, we don't read a book about the desert; we go to the desert."

The school, which consists of a large yellow school bus crammed with books, food, musical instruments, camping gear and other

equipment, goes to places such as the Florida Everglades, prehistoric Indian sites, Amish communities in Pennsylvania and the Environmental Protection Agency in Washington, D.C.

Mike Cohen, one of three adult guides at the school and the man who organized the 10-year-old program, said the students learn to question the natural environment, their social environment and themselves during the September-to-May program.

"They answer their own questions, not someone else's questions," he said. About 90 percent of what's taught in traditional schools is forgotten after a year, Cohen contends, because it wasn't learned out of curiosity but for a grade.

The students currently are camped at Griffith's place just outside the Papago reservation near San Zavier mission.

Griffith is one of about 150 experts, specialists and resource people the school draws upon around the country.

Every 10 days, taking advantage of the compact library on the bus as well as university libraries around the country, each student produces a paper. Then everyone else reads all the other papers and they're discussed. Students react to the grammar, style and content.

All this is the academic aspect of the school. But there's more to education than mental calisthenics. While the intellect gets a good workout, other facets of the program exercise the student's judgment.

They learn to shop for themselves, feeding 23 people on $60 a day. Chores are handled by work committees, which are reorganized periodically so each student gets a chance to work with everyone else in the school. And emotional maturity comes in working out differences among themselves and meeting as a committee each day to decide what will be studied the following day.

The students said they avoid "cabin fever" while living in close contact with one another by bringing their feelings into the open and discussing them. In the process they become very comfortable with one another and self-confident. They form a closely knit community, but one in which a stranger is immediately made to feel at home.

By the standards of 20th century urban America, the school is austere. In fact, by the standards of 19th century America, the school is austere.

As in Thoreau's camp near Waldon Pond, material life is reduced to basics. There is no TV, no radio, no stereo; just the tents they camp in each night, the battery-powered lights inside the bus and the Coleman stoves they cook on.

By all American standards, these people are deprived. They don't even have access to a shower every day.

They have more to do than they have time for, however, unlike many teenagers.

Frank Trocco, another adult guide, said that's probably because most teen-agers aren't given any responsibility for their own destinies.

In the institute, however, the students have total responsibility for themselves. There are no authority figures. Trocco said he and Mike and Diana Cohen act only as catalysts. All the organization for the program is in the hands of the students.

"Every evening they deal with problems that come up," he said. "They get the solution plus the process of dealing with the problem that very few teen-agers have contact with."

The group also has the strong awareness of the environment that comes from living in a non-electric kind of way. Without TV, movies or recorded music, students must make their own entertainment. Several have learned to play musical instruments. Two play the fiddle, three are on penny whistle, two play guitar and one picks banjo. Everyone sings and dances.

Other forms of entertainment include hiking and camping, which are educational experiences in themselves. One student said: "It's a way of enjoying things that isn't destructive to the environment."

"We just want to show people that a low-impact lifestyle can be feasible," one student said.

The Audubon Society, traditionally an innovator in environmental education, began sponsoring the institute because it concluded that many conservation problems are caused by the way young americans are taught to live.

"This (institute) can be done on a much larger basis," Trocco said. And that's what Audubon plans to do, he added.

The institute is starting an intern program to train leaders to take groups like this one around the country. Information about the intern

and the regular programs can be obtained by writing to: Audubon Expedition Institute. 950 Third Avenue, New York, N.Y. 10022.

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[1]Extrapolated from an address given at the University of the District of Columbia Conference on Talent Development for Environmental Careers, Washington, D.C., August, 1979.

[2]Paraphrased from Gazelle Boy by Jean Claude Armen, translated by Steven Hardman, Universe Books, N.Y. 1974.

[3]U.S. Government Study on Background Radiation, Nuclear Regulatory Commission.

[4]Edited from Across the Running Tide, Michael J. Cohen, Cobblesmith Publishers, Freeport, Maine, 1979.

[5]Environmental Education Report, March 1977, Center for Environmental Education, Washington, D.C.

DEVELOPMENT OF THE PERSON AND SOCIETY:

THE CHALLENGE FOR EDUCATION

by Walter Bogan

Walter Bogan is the director of the Office of Environmental Education, in the Department of Education. Prior to this he served as assistant to the director of the science and public policy program and lecturer at the New School for Social Research in New York City. He currently serves on the Board of Governors of The Nature Conservancy. He has authored numerous conference papers and journal articles on environmental education.

In the recent affairs of the nation, environment seems to be ground over which opinions divide. Concern for the environment seems opposed to the economic imperatives of industrial society. Environmental concerns have been criticized as an unwelcome complication of economic development on grounds that they add years to the time required to complete public works and impose burdens of regulation on business that threaten our competitiveness in world markets. On the other hand, economic development activities have been criticized as harmful to our environment.

This dichotomy of environmental and economic concerns has been observed by many to be false. If environmental education is to enter a new phase of fruitful service in the 80's, it will be necessary to demonstrate that improving the quality of life stimulates local and regional economic development and that education is vital to improving the quality of life.

In organizing environmental education we need to self-consciously and publicly talk about the importance of well rounded education of children. People who are concerned with the gifted and talented are

self conscious about the periodic importance we place on the development of talent that is well rounded.

To document that the importance we place on talent development is periodic, Herb Alf reminded us of the Sputnik era which sparked a brief movement for radical educational change when the crisis it signaled, in being outdone by our adversary in space flight, was diagnosed as a crisis of inadequate talent development. From the time frame of the late 50's and early 60's, Herb Alf further found a signal for his concern that at this time environmental crisis may be similarly diagnosed as a crisis of inadequate education. I think this period of the late 50's and early 60's is significant from a number of points of view.

I will review with you briefly that most turbulent period in our history. The 60's was a decade of torment. At the same time it focused on human revolution. Individuals and groups acted out personally such themes as the civil rights revolution and the feminist revolution and the theme of environmentalists with regard to the hazards of the testing of nuclear weapons.

The environmentalists had in many ways, for a long while, attempted to call to the attention of their fellows the importance of maintaining some sense of responsibility and stewardship. They had attempted to communicate the fact that the planet had to have assistance in several significant ways, not the least of which was the ending of atmospheric testing of nuclear weapons which resulted in the accumulation of radioactive material in the biosphere.

I was an undergraduate in chemistry in the late 50's, and in the early 60's I was involved in a number of academic pursuits, all of which shaped my perspective on some of these problems.

I became interested in the movement against the release of the accumulation of strontium 90 in the teeth of children. This for many of us brought home, in another light, concern for the way in which we are behaving on this very complicated, but at the same time very delicate and fragile earth and its near environment. We began to further appreciate the fact that the atmosphere continues to circulate all of those things that we sometimes naively and unwittingly think that we have thrown away. We became fully conscious of the fact that there is no "away" with some of the kinds of materials we are dealing with.

The second large area for learning was a similar kind of lesson. In fact, it was assisted conceptually by the earlier experience with radioactive accumulation. This is the recognition of the accumulation of DDT and the failure of recognition, the somewhat interesting denials, and the effort to defeat the assertion that if DDT was accumulating it could be demonstrated to have negative or debilitating effects. In this lesson we were indebted to a few alert and committed ornithologists, a few who perceived several indicators of an accumulation of dangerous material.

Through this evolution of perspective a sense of community began to develop between those who were most concerned, philosophically, and most committed, personally, to understanding and appreciating the research literature. There came to be not only a people-to-people sense of community but also a conceptual community. One remembers the scientific community of persons who could recognize their investment in defending Rachel Carson, for example, not only for her humanity, but also for her science. For you see, there was a long period when both were denied.

Some of us who grew up in that period have come to see, in a variety of ways, that the lesson of our community is no more real because DDT and strontium 90 brought it home to us than it was in the poetic statement of John Muir that everything is connected to everything else. As we learned a number of these lessons, in a number of different ways, we began to appreciate that, in some instances, poetry can serve with science.

Thus I have come to the perspective expressed earlier that environmental education needs to be organized as well rounded education of children.

I think that it would be well for the community of scientists of our era to recall these lessons as we think about education for the future. As we think about careers, vocations, as we think about the gifted and talented, we need to be as open as possible in exploring what are relevant gifts. We need to structure education that is open enough to allow these gifts to come to fruition so that at some point someone might say, "there was a talented person." There are not nearly enough opportunities for people to bring their giftedness to the community in ways that allow their talents to be appreciated.

I would like to go back to another part of my background. I spent a fair amount of time in several different kinds of classrooms, and I would like to share some thoughts about environmental education as gained from this experience as a teacher. In looking at the substance of environment and the substantive part of the Act of Congress, of 1970, establishing environmental education, the two terms that I find of greatest significance for educators are *process* on one hand and *relationship* on the other. It is my view that the most significant contribution that environmental education can make to education generally is, on one hand, to stimulate awareness of the myriad of processes through which learning takes place and, further, to look continually for the extent to which the learners are beginning to give evidence of understanding relationships.

It is my view that one of the key indicators of successful capacity to cope with environment is the ability to perceive relationships, the ability to discern patterns. I would hope that what we would all be about in education is facilitating the discovery of the patterns which connect. "Patterns which connect" was used by Gregory Bateson who suggested that this metaphor was most compelling for him in understanding the relationship between mind and nature which he discusses in his book, *Mind and Nature*. Working with a similar theme, Theodore Rosak pursued the interrelationships that exist between person and planet in his book, *Person Planet*.

I am not going to elaborate the development of these theses but commend both works to you for study.

When we talk about development we need to talk about development of the whole, not about the development of one part at the expense of another part. Too often, significant energy and commitment is invested in the development of those parts which people presume are easiest to develop, or that they have greatest interest in developing. There is also a tendency to invest the greatest energy and commitment in the segment of development for which there are publicly agreed upon measures to attest to the extent to which it has been developed or not. We are urged by subtle but nonetheless powerful pressures to develop segmentally and somehow make believe that such development will suffice. That is, we are urged to pursue segmented development as a surrogate reality in education,

and now, after graduation, we are expected to impose that development as reality. Such a process of education makes us blind to the true potential of the person, the person, not an individual or personnel: the person.

Similarily, the planet has in many instances been perceived segmentally. Significant energies have been put into sectorial, segmental development without conscious or even sensitive concern for the impact of that segmental development on other sectors of the solar system. In my view it is the challenge of environmental education to demonstrate the John Muir wisdom that everything is connected to everything else, that people and planet are in reality one, and that the person, the planet, and the solar system cannot be fragmented. I think that environmental education has a significant responsibility to society to assist the willingness of larger and larger numbers of people to accept this challenge.

Such a challenge is consistent with the TDEC effort to get most gifted people working on very, very important societal problems. I think sometimes one of the most significant dilemmas that I see in our culture is that some of our trivial problems get the lions share of our talent. Too many talented people are working on dull problems. We need talented people working on hard problems. We need talented people working on problems that require caring — caring about persons and caring about the planet.

The challenge of this situation is not to be resolved by the speed with which the individual can learn all of the routines that can all be done by the members. The challenge is to work out ways in which groups of people can learn from each other how to understand different perspectives and experiences and how to share their different perceptions. Because how we perceive the problem is a function of where we sit, and if we can assist each other in becoming self conscious to the inhibitors to our ability to see the problem, we can make a truly important contribution to education and society. If we can moreover be supportive of each other in our efforts to come to grips with the problem, in spite of these deficiencies of perspective, then environmental education will become a means of pursuing those activities that are of maximum consequence.

Now there are innumerable things that I have not spoken of, about where environmental education is, and how, if you will, it got there over the last decade. So many things have been forced to the public consciousness, at least in the last decade, that there is a need for regrouping, reassessment, rethinking of what the past has meant for the present and how the present will form the future. We tend not to examine the kind of future we want to have, and then ask ourselves how should that chosen or willed future inform the present. As stated at the outset, the challenge for education is to develop the capacity to pursue quality of life concerns in the context of economic development needs and a democratic decision making process.

THE ECONOMIC/EMPLOYMENT/ ENVIRONMENTAL CONFLICT

by Richard Grossman

Richard Grossman has been the coordinator of Environmentalists for Full Employment since 1976. Prior to that he worked at a number of different employment training programs around the country and served in the Peace Corps in the Philippines. Environmentalists for Full Employment is a national environmental organization which promotes the concept that there need be no conflict between providing safe, socially useful jobs, and a healthy community and natural environment.

Environmentalists for Full Employment is a national organization created four years ago by several hundred community and environmental groups. We came into existence because we felt that environmentalists were falsely being characterized as anti-job, and were being falsely blamed for factory shut downs and job losses. Time and again, polluters were yelling and screaming that they couldn't afford to clean up, and were blackmailing their employees to join with them to oppose health and environmental laws.

So we've been looking at the relationship between health, environment and employment. And we've tried to serve as a bridge between different constituencies — primarily environmentalists and labor unions.

It's our contention that people should not be forced to choose between no jobs and jobs which kill them. We believe evidence shows clearly that we **can** have both a full employment economy — characterized by productive, socially useful jobs — **and** healthy workplaces and natural environments. What we find is that the polluters/ employers are in a unique position to tell those opening their mouths

about public health, workplace health, or the environment that, if they don't shut up, they won't have any jobs. It's what we call "environmental blackmail." It's happening all over the country and will happen more and more as the economy gets worse.

One of the regrettable ingredients in this problem is that the polluters/employers have been able to control the nature of the debate over environmental issues. They have sought to determine what assumptions we all must accept and what the various criteria for decision-making should be. They've been able to over-simplify very crucial issues in ways which get them off the hook for their own responsibility, or culpability. They claim: the choice is between the good life which they have made possible and environmental extremism which wants to put people out of work and send the nation back to the stone age. And they try to get most people to believe that questions of health and environment are merely matters of aesthetics, frills we can pay attention to when the polluters/employers have finally made us all wealthy enough that we can afford to clean up.

Somehow, they are often able to make the "environment" seem to be something ill-defined and far away, especially when contrasted to the stark reality of jobs tomorrow morning, or the "economic development" of a community. What they obscure is the fact that encompassed in the "environment" are people, people trying to live, and trying to leave behind them usable clean water, clean air, and ample resources for their children.

But the polluters/employers have different sectors of society battling one another. And they have communities and regions at loggerheads as well. And they tell us: we have no choice but to do as they say.

Here's an example. David Packard, President of the huge Hewlitt-Packard electronics company and former Assistant Secretary of Defense, testified before the California Energy Commission. He told the Commission that if the San Onofre nuclear plant — which is completed but not operational because of recent discoveries that it sits above a major earthquake fault — was not fueled up, he and hundreds of other electronics employers in California would have to consider going elsewhere — with their 50,000 jobs! Nowhere did he even acknowledge the other energy options California has, such as increasing energy efficiencies, turning to different solar technologies. And

nowhere did he suggest that the evidence is overwhelming that the energy technologies which are the safest also create the most jobs!

And frankly, it's difficult for me to understand how having hundreds of expensive and inefficient nuclear plants across our land, each of which contains 1000 times the radiation of the Hiroshima atomic bomb, contributes in any way to the preservation of anything . . . except perhaps to the profits of the nuclear industry.

I hope that environmental educators will begin to address these matters of economic-employment-environmental conflict. Very few people in the government bureaucracies are paying much attention. And the consequences of giving in to the polluters and their blackmail are increasingly costly, and often, irreversible and beyond a dollar value. A cursory review of the literature indicates that the costs of pollution — in damage to air, water and environment, in lost jobs, lost productivity, lost income — are currently more than $100 billion per year. That's hardly frills or "mere" aesthetics. We're talking about extinction of species, damage to our genetic pool, cancers, destruction of prime agricultural land, permanent contamination such as wrought at the Love Canal.

I think there's a tremendous need for young graduates in the field of economic development who do not consider preservation of species and resources, public health, environmental preservation to be "frills." We need environmental economists who will be able to challenge the claims of polluters and employers that we have no choice but to knuckle under to them. There's a great need for people with these skills — not just in government, but also in the world of the polluters/employers, in labor unions, in banks, in politics — especially at the state and local levels where so many development decisions are made. I believe that environmental educators must raise these issues and encourage students to be thinking about the real world out there — where protecting our health and our environment turns out to be a full-time job for millions. We must take back control of our public policy definitions and the selection of assumptions and priorities, if we want to protect human life and our communities. We must help inspire and inform the people who are so desperately needed to carry the message *outside* the schools and universities and into the political arena where our futures are being decided.

Section II

ENVIRONMENTAL EDUCATION MAPS AND MODELS

INTRODUCTION

by Herb Alf

Here we have a fortunate opportunity to be introduced to the programs and plans of the United States Office of Environmental Education over the last years. The writing informs of: (1) efforts to create models of what environmental education should be; and (2) efforts to develop sets of materials that can help actualize ideal environmental education.

I feel that you will share my appreciation of the ambition and scholarship of the research here reported. This information makes an important contribution to the TDEC confluence of perspectives for optimal, environmental, human resource development. We will see what new patterns of creative insight emerge as we later hear from other voices.

MAPPING ENVIRONMENTAL EDUCATION

by John N. Warfield

Dr. John N. Warfield is the Harry Douglas Forsyth Professor of Electrical Engineering at the University of Virginia. His primary area of interest is public systems, and he has been active in developing methodology for the analysis and design of public systems for over eleven years. He has been involved in education research intermittently since the late 1960's when he directed a Title III project to develop a plan for the public schools system in Ohio. He has served since 1977 as director of a project on environmental education sponsored by the Office of Environmental Education. His book SOCIETAL SYSTEMS: PLANNING, POLICY, AND COMPLEXITY (John Wiley, 1976) presents the accumulated results in his work up to the time of publication.

On a dark, rainy Saturday a truck pulled up outside our building at the University of Virginia with about two tons of paper. This was the beginning of our project. The truck held about two tons of materials relating to past grants funded by the Office of Environmental Education (OEE). This particular task involved looking at about 700 grants. Not all of these grants turned in final reports. We looked at all these grants and what we did was develop a means of giving a capsule description of each grant. We tried to put together a two to three page document on each grant so that someone could take that set of about 2100 pages and maybe in three or four hours, by skimming through that whole set of material, get a very good image of what went on during about seven years of grant activity.

Another goal that we had was to try to find out what was available that would be suitable for shipping to Ohio State for eventual filing in the ERIC system so that people could get access to the products from these grant activities. Right now we are in the process of exchanging material with Ohio State. We ship them a batch of material, they photograph it, microfiche it, and ship it back. Then we send them another batch. I cannot tell you exactly when that process will be concluded but hopefully it will be before the end of this year. Certainly, they have some of that material available now.

The second major task is to develop a conceptual structure for environmental education. There were various aims to this task, but certainly one aim is simply to make it possible to demonstrate to the Office of Management and Budget what the field of environmental education consists of, what kinds of things can go on in this field, and how these things are related to one another.

We wanted to map environmental education as it should be, based on what I call structure representation from the field. We were not trying to render a verdict from our own opinion of environmental education, but rather we were trying to amalgamate the best opinion we could find by merging ideas from literature and people, etc.

We took four primary sources. One was the Environmental Education Act itself and the regulations accompanying the act. The second source was the Final Report of the Environment Based Education Project issued by the Center for Environmental Studies at Arizona State University in cooperation with the Association of American Geographers. We refer to it as the "Arizona Report." The third source was the Report of the UNESCO Intergovernmental Conference on Environmental Education, and we shortened that to call it the Tbilisi Report, since that came out of a recent Conference held in the city of Tbilisi in the Soviet Union. The fourth source was the OEE grant materials themselves. What we were looking for here was what we call "elements" in environmental education. These are things that people said should be part of the environmental education. Most of the things we selected were activities that people said should be going on in environmental education. Some of the things we selected were learning outcomes, things that people said should be consequences of environmental education.

Our mapping team consisted of people representing several of the subcontractors, primarily. About 161 of these elements were collected. We developed this large structure which was called, "the Big Map." It has a superstructure and seven ministructures. The ministructures relate to planning, learning outcomes, systems support and development, and evaluation. The learning outcomes are objectives.

It turns out, in retrospect, that we are using what amounts to a new language, and it is a graphic language that has the advantage that you can get a lot of information on a fairly small space. One begins to see that there is a form of communication that has some significant merit and some significant challenges associated with it in terms of reading. If you get material that would normally occupy ten pages compressed on one page, then a person gets a new perception of how long it may take to read all that and a new perception of learning how to read such a thing.

Of course, the question of why you want to do that comes up. The answer to that is that there are a lot of people in this world that have influence that don't have much time and like to look at just one page. That's one answer. Another is that I like to compare that form of presentation to sheet music where you put on sheet music something that you could translate into words. You could go through it and say, "First you play a flat, and make it a quarter note." So if you translate a page of sheet music this way it would take ten or twenty times the space that it requires for the graphic display of the music. It is very important that it be translatable but it is also important that we *don't* translate. It is sort of a paradox. If it weren't translatable, a musician couldn't play with it, but if you had to translate it, the musician could never follow it because it would be too strung out. So, it is something like that. We are trying to build a way of portraying an image that has the property that it can be translated. Hopefully, we never go to the bother of doing it.

So, both the Big Map and the Learning Outcomes Map are things we prefer never to have to translate, but we could if we had to, and they show things that we like to see as one image and scan rather than take the trouble to read through all the material.

One reason we use that kind of thing is that we think it has applications in learning the subject matter of environmental educa-

tion; that is, the concept of EE itself is fairly broad and has a lot of elements. We think that the EE Act and the interests of people both suggest that we study the relationships, and that is what the maps portray. That's a quick brush through mapping.

Now, I will move to the third phase of our project, which had to do with the future of environmental education. The way we've been putting that is that we are talking about learning system design. Since that language seems a little formidable, I think I need to begin by saying a few things that preface that discussion.

Here are some points that came out of the RAND Report*, a study that was done over about a two or three year period to see what works in an education project. One is the use of local strategies that (in their language) promote mutual adaptation. What that means, I guess, is clarified by the things that follow. You have teachers, specific and extended training, classroom assistance from project staff, teacher observation of similar project meetings, and teacher participation etc., school organization and leadership, particularly involvement of the principal.

I think if there was anything heavily stressed in that report it was the importance of the principal in terms of getting things done in the school.

Another thing that was mentioned was the district management capacity support. The report said that districts vary a great deal in terms of their capacity to manage projects. If you find a weak management capacity in the district, chances are that things won't work out too well.

We looked at these conclusions, and we said that there are some implications for Federal policy there. These are things that we just want to take into account in our own work. They are sort of cautions to us, things to keep an eye on. Assumptions about educational change processes are important. Prevailing assumptions from the past are not to be trusted. We have to look at all of them and think them through again.

The RAND people said there are three assumptions that represent the Research and Development point of view towards projects. They felt we should drop these assumptions. They said these assumptions are outworn and not very good. One was that *to get approved educa-*

tional performance you have to have innovative techniques. They said that is not necessarily so. *You have to provide missing resources.* That's not necessarily so. *You have to have a target when the project opens,* and that is not necessarily so.

They said that you could expect to get educational performance improvement if you paid attention to the status of all the local chain processes. The "all" in that statement is important. Look at all those things because some of them presumably are weak. If you could strengthen those, you would have a system going that would function. Then they gave some assistance for what they call adaptive implementation. I guess what they mean by that is that if a project works out in Utah, maybe, and somebody in Tennessee wants to use it, probably what was done in Utah wouldn't work in Tennessee exactly. That's the kind of thing they were talking about. They stressed the importance of people going and looking at the project in Utah rather than reading about it. Then in discussing the capacity of school districts to manage change they talked about providing assistance in managing change. We took most of those things to heart.

I think we agree with most of them and we are working now on what we call the design of an environmental learning system with the idea that if we provide the people in the local areas, local communities, with some design tools and methods and some facilitative assistance that they could design their own learning systems.

To try to facilitate this, we developed what we call an "options field" that local people could use to design their own regional environmental learning system. We came up with a ten dimensional design concept. There are ten categories of options which we think people need to consider in their learning systems.

The options field allows portrayal of chosen options by just drawing lines on the chart. The lines are called the options profile. The use of the options field was tested recently by a group in Nashville. We had a group of about 12 teachers and asked them to try to check out our recommended approach. There were two things to check out. First of all, there was the process: how do you actually go about doing the design with this kind of aid? We gave them a design process and a facilitator. We said, "Look. Here is something you can use to design your own learning system. We will facilitate your process if you want

to do it. And we would like to see how you would go about it."

The first step was to figure out how the dimensions interact with one another. In doing this, the group decided that we had left out the middle school under one of the dimensions. They looked at the types of setting for EE that we had, which were: post secondary, secondary and elementary. They said we need another option: middle school. They wiped out the elementary.

How do you focus EE and what options do you pick? This has got to be very confusing to anybody, but it is all spelled out (we think) clearly in our report, which is in the process of being written up. What we are trying to do there is to show how you can form a group with a kind of local control and regional orientation, build a network, and design your own environmental learning system using only the materials that we have developed and not necessarily keeping them in the exact form in which we present them but changing them if you desire.

ENVIRONMENTAL EDUCATION MODELS

by Stephen R. Mills

Stephen R. Mills, Ph.D., is a project coordinator at the Far West Laboratory for Educational Research and Development in San Francisco. During the past ten years, he has been engaged in developing, testing, and evaluating various in-service training courses involving expository teaching, divergent thinking, role playing, classroom mamangement, and independent learning. Recently, he has been involved in several research and development projects that focused on environmental education. These include: the design of environmental education training models for teachers and community educators, the development of energy-focused, self-directed teacher training units, and the development of a model and guides for the design of environmental education curriculum delivery systems. He has co-authored numerous technical documents and reports, conference papers, and journal articles.

The Arizona Study and some previous work done by Cal State University in Pomona developed several notions about what environmental education should be — as does the Environmental Education Act. Based on this previous work, what we did at the Far West Laboratory was to develop four models which describe what environmental education curricula are for four different audiences.

Since the first audience was educators at the high school level, the first model was designed to present a secondary level environmental education curriculum that could be taught, possibly, as a separate course. The other three models were developed in order to broaden the ways that environmental education could be implemented. Thus,

the other models were designed to depict environmental education for social studies teachers in grades 4-12, for natural science teachers in grades K-9, and lastly, for the most difficult audiences to characterize, community environmental educators.

What I would like to do now is describe some of the aspects of the high school model and some teacher training materials that were based on the concepts and the basic images of this model. Our work at the Far West Laboratory has gone from designing ideal images of what environmental educations is, to developing products that help practitioners create, or actualize these images through educational programs in their schools.

With respect to the teacher training models, I have described the four audiences that we designed them for. The nature of environmental education depicted in these models was something that was very solidly embedded in the literature on environmental education and on the collective experiences of practitioners who had been teaching (or trying to teach) environmental education for years.

Essentially, environmental education has three basic aspects. It should be holistic. By that I mean it should focus on natural systems by teaching people about natural processes, cycles, and resources. It should also focus on human systems. That is: how does the human species impinge on the environment in order to actualize its needs? Environmental education is really a melding of these two very diverse aspects of knowledge into one image of the total environment in which we are living. In essence environmental education focuses on the interrelations between these two systems, because emphasizing only one amounts to doing no more than social studies, economics, political science, or other traditional human systems-oriented subject matter, on the one hand, or doing natural science (biology or zoology) where you are studying traditional natural systems-oriented subject matter. Environmental education is more than this — which gets us to the next aspect.

Environmental education should be transdisciplinary. It should involve a way to study the environment, human systems and natural systems, in a way that is more than just a narrow, single, discipline oriented view. This may seen obvious, but you would be surprised at some educators' notions of what environmental education is. They often equate it with natural science, the way it is traditionally taught,

or think of it as outdoor education, essentially nature appreciation. They rarely think of it, for example, as getting students to grapple with the major energy and environmental issues of the day.

This last point — grappling with issues — is the third, and final, important aspect of environmental education. Our teacher training models portray what environmental education is in these terms. They also present a number of considerations of the design of environmental education in teacher training. The models examine environmental education in terms of an overall behavior model of knowledge, skills, and awareness or attitude outcomes. They also examine specific kinds of content, subject matter or topics that should be explored. They also examine instructional or curriculum management processes that are necessary to carry out environmental education in the classroom. These considerations, then, are all portrayed in the teacher training models.

We can now examine in more detail some of the components of environmental education portrayed in these models. Let us begin with the curriculum content since this component is most often addressed first by practitioners designing environmental education for their schools. Here we run into a problem where many practitioners start off by defining general learning objectives, then selecting content to achieve those objectives, that is overly bound by their traditional subject matter areas.

The teacher training models suggest, therefore, that environmental education concerns itself with subject matter specified in the Environmental Education Act: pollution, population, urban and rural planning, economics, technology, energy, transportation, conservation, resource allocation. Although these are all different topics, we feel that they can be interrelated and dealt with effectively through the investigation of environmental issues.

This conclusion is one of the key aspects of the Environmental Education Act. By the way, all the products (models, units, etc.) that I will be describing are designed to be general enough to allow for local adaptation. Obviously, the more specific we get the less useful it is in any given context. We are always trying to devise materials and conceptual models that practitioners can understand and adapt to their own local purposes and needs.

The models also portray a different kind of curriculum content that allows one to address the topics specified by the Environmental Education Act, as well as to address environmental problems or issues. This content includes the following: (1) energy and environmental related career decisions; (2) analytical tools for understanding energy and environmental systems (including such systems concepts as cycles, energy flow, linkages, interactions, and so on); (3) energy resource delivery systems (that explore sources of energy and systems of transforming these sources to human end use; (4) holistic life style assessments (which analyze basic human needs, life styles, and values); (5) forecasting, planning, and policy formation (which focuses on managing the environment, proper use of resources, and forecasting the impacts of our present technology paths); and (6) futures thinking, which looks at our future desires — where we want to be — and alternative ways of achieving them.

This type of environmental content is elaborated in some detail in another document we developed called the sourcebook. The source book presents teachers or curriculum developers with a host of topics, ideas, and concepts that might be adapted and developed into environmental education content suitable for various subject areas and consistent with the requirements of the Environmental Education Act.

After we developed the four environmental education teacher training models (for high school, natural science, social science, and community educators), it was decided that our next step should be to develop a set of exemplary teacher training materials based on one of the models. Our decision to develop materials for teacher training seemed to us a logical place to start. Our approach has been to get the teacher to be more independent. Our attitude is that you want to enable teachers to develop their own material — or to readily adapt materials — for their classrooms so that they are not dependent on some external source to feed them materials which they implement as isolated units that are only marginally integrated with their subject areas. Our task, then, was to develop materials that would train teachers to think holistically about environmental education. To do this, the materials focus on environmental issues and on issue-oriented activities that can be adapted to their classrooms.

We developed a set of four teacher training units. For each unit, we selected a different environmental issue. These environmental issues were land use, urban growth and the quality of life, energy conservation, and energy resource delivery. We designed these modules so teachers would learn about environmental issues, and then learn how to apply that knowledge to their classroom. Each of the training units is broken down into three sections.

In the first section, teachers learn about an environmental issue through reading and discussion. In the next section, they apply their knowledge and understanding in a decision making or problem solving task. In the last section, teachers apply their newly acquired knowledge and "experience" in designing issue-oriented learning activities for their students. In each of the units, teachers learn different things.

For example, in the land use units teachers perform a carrying capacity analysis of a local area to determine its suitability for (and the tradeoffs involved in) a proposed coal mining operation. They address various questions like: What kinds of impact would a coal mining operation have in the region? What kind of restrictions should be placed on the coal mining operation, if any? Would the benefits of having coal mining outweigh the negative "costs" to the local environment?

In the urban growth unit teachers examine patterns of urban growth and their impacts on human living. They apply what they learn to designing an ideal urban place or to designing improvements in their own local urban area. In the energy conservation unit teachers analyze their personal energy consumptive patterns. They engage in an analysis of the President's national energy plan to determine its adequacy, and finally, in the energy resource delivery unit, teachers look at alternative energy futures in terms of technologies necessary to obtain them. They also engage in analyzing the national energy plan in terms of its implications for future energy delivery.

The gist of all this is that teachers acquire knowledge about environmental issues. They apply this knowledge in a realistic problem-solving or decision-making activity. And they apply this

total experience to adapting environmental issues and topics for their classrooms.

We have begun testing these teacher training units with pre-service teachers in colleges and universities and with in-service teachers in intermediate and secondary schools. Most of the teachers who used the units ranged from beginners who were interested in environmental education to individuals who had taught environmental subjects for several years. In all cases, regardless of how long they had been doing "EE" or how sophisticated they were, their responses were very favorable in terms of learning a "new way" to think about environmental education and, specifically, learning in depth about selected issues which have broad application to many environmental topics and concepts.

Currently, we are trying to develop a model that portrays typical structures, processes and problems that school personnel must address in trying to get environmental education going in their schools and classrooms. We call it an environmental education delivery model. This model has nearly been completed.

Starting later this year, we are hoping to move into developing a similar kind of model which would portray environmental education in public schools linked with community environmental concerns. This is of interest because the community offers a vast, untapped reservoir of know-how, skills, and resources for studying the environment, appreciating it and doing something about its problems. Since the community seems to be issue and problem oriented, while formal education seems to be topic oriented, getting these two sectors together should enhance the environmental education in this country.

Section III
ENVIRONMENTAL CAREER EXPLORATION

INTRODUCTION

by Herb Alf

Both natural and built environments are discussed here as career fields pertinent to achievement of more fortunate person-planet symbiosis. The reader is left the creative role of discovering dynamic interrelations between natural and built-environment concerns.

The opportunities and challenges discussed are international in scope. With the continuing worldwide intensification and spread of technology and the growth of world population, we can expect increasing dependence upon environmental experts, for better or worse. That is why education now for tomorrow's environment is so important.

The environmental career field is global whether we like it or not. With the atom bomb we lost a place to hide, and now we are beginning to understand that we never did have a place to throw things away. We are inescapably a part of the dynamic interrelations of the whole earth. Not by our choosing, but by the nature of our reality, the scope of environmental career opportunity and challenge extends across the whole of psychological, social, political, economic, creative, religious, and geographic dimensions of our time. The descriptions of these pages are only a beginning.

NATURAL RESOURCES MANAGEMENT THE CHALLENGE

by Richard Pardo

Richard Pardo is the program director of the American Forestry Association, a national citizen conservation organization based in Washington, D.C. A native of Seattle, Washington, Mr. Pardo received his B.S. degree in Forest Management from the University of Washington. He also holds an Ll. B. degree from Harvard Law School. Mr. Pardo has been Director of Programs for AFA since 1974.

The 1970's has been referred to as the "Environmental Decade and, indeed, it was.

The National Environmental Policy Act (NEPA) was signed into law by President Nixon for New Year's Day of 1970, the first day of the decade. With that action the Council on Environmental Quality came into being and the Environmental Impact Statement was born.

April 22, 1970, brought Earth Day and before the year was out reorganization within the federal executive branch created the U.S. Environmental Protection Agency. This new agency incorporated the major programs for controlling air and water pollution, environmental radiation, insecticides, and solid waste. Offices dealing with noise and toxic substances were added to EPA in the next two years.

1973 saw the passage of the Endangered Species Act, greatly strengthening the protection afforded to endangered animal species in federal programs and adding plants to the list of endangered species for the first time.

In 1975, controversy over timber harvesting policy on national forest lands came to a head with a landmark court decision which was

followed by extensive Congressional debate and passage of the National Forest Management Act in 1976.

Other significant natural resource laws passed during the 1970's include: the Coastal Zone Management Act, the Renewable Resource Planning Act, the Resources Conservation Act, and the Federal Land Policy and Management Act, all aimed at improving and strengthening natural conservation programs.

The decade also saw expansion of the National Wilderness System, the National Park System and the National Wildlife Refuge System as Americans became increasingly sensitive to the need to protect special environments and resources.

Never in such a short period in our history have so many environmental laws and programs been promulgated.But what has been achieved is still only half of the resource conservation job and the easiest half at that. Obscured by the emphasis on environmental protection of resources has been the need to match resource preservation with resource production.

Environmental preservation often carries with it the idea that "nature knows best" and that man is a destroyer of the environment: as if all we need to do to ensure enough resources is to let nature take its course.

The simple fact is that if we are going to preserve critical environments and still provide for the needs of our expanding population for food, timber, recreation, wildlife and other natural values, we need to give nature a hand in bringing our lands up to their productive capabilities. This is the tough and challenging job facing the person who chooses natural resource management as a career. It will require intelligent, educated, and dedicated people. If the natural preservation gains of the 1970's are to be maintained, the challenge of the 1980's is to provide increased amounts of food, fibre, water, recreation, forage and wildlife habitat from those lands not dedicated to special protective categories or converted to other uses.

There is an electronic display on the side of the building at 18th Street and Connecticut Avenue, Northwest, Washington, D.C., that tallies the minute-by-minute growth of world population: 172 babies are born into the world every minute and the total world population is fast approaching four and one half billion. According to the U.S. Census Bureau, the total population of the United States on March 1,

1980, was 222,410,708 which is up more than two million since a year ago. This is an increase of 204,000 in the month of February alone. The year's increase was enough to fill the city of Berkeley, California, twenty times.

At the same time that we are adding these lives to our environment, analysts tell us that we are losing three million acres of farmland each year — one million of it classed as prime farmland — to such uses as industrial and residential construction, highways, airports, shopping centers and so forth.

Affordable housing is becoming a national problem, and housing takes wood. Next time you go by an urban or suburban housing project or development, take a look at how much wood is going into these homes for framing, flooring, siding,and roofing. Where does all the wood come from? Not from national parks or wilderness areas or wildlife refuges. It comes either from public and private timberlands managed for continued crops of timber or from the exploitation of forests of foreign countries through imports of wood products.

And if forest lands are to be managed for improved timber production, how will wildlife be affected, soil and water be conserved, and recreational values and needs be met?

Part of the answer lies in making better use of the resources by reducing waste, increasing recycling, finding new ways to use wood residues, developing better construction methods, and a host of other consumer conservation measures. But even if we do all these things, we must still do a better job of managing for resource production.

This year two reports will be sent to Congress on the status of our Nation's renewable natural resources. One is being prepared by the Soil Conservation Service and deals primarily with soil and water conservation issues. The other has been prepared by the U.S. Forest Service and deals mainly with wildlife, timber, rangelands, and outdoor recreation resources.

Both of these reports attempt to assess the predicted supply of those resources over the next fifty years as contrasted with the demands which are expected to be made for the resources. The outlook is not as optimistic as it could be. As the Forest Service reported in a summary of its findings:

> "This assessment shows, as did the preceding one (1975) that the Nation's demands for nearly all renewable resource products

are increasing rapidly in response to growth in population, economic activity and income. The capability to meet these demands, assuming forest and rangelands continue to be managed much as they have in the last couple of decades, increases much more slowly. Thus the nation is faced with the prospect of a growing imbalance between what people would like to consume and the supply."

"This outlook. . . " continues the report, "has some important and adverse economic, social, and environmental implications." Among these are rapid and continuing increases in prices for lumber, plywood, and other timber products, leading to increased imports of these products and the substitution of materials such as steel and plastics. This means increased costs to consumer for such things as homes and furniture; rising environmental costs from mining, industrial processing and power generation associated with the increased use of substitute products; and an accelerated use of nonrenewable resources.

The outlooks for forage and water are similar. There will be higher costs to consumers and the associated impacts on the economy, the environment and society.

Additionally, the Forest Service reports:

"For users of wildlife, fish and outdoor recreation resources, it will mean intensifying competition for available supplies and a decline in ecological diversity. The situation could lead to shrinking wildlife and fish populations and a more restricted distribution; fewer and less-satisfying outdoor recreation opportunities for such activities as camping, hunting, bird watching, wilderness camping; and, overall, a gradual deterioration in the quality of life which the nation has come to appreciate and expect."

But the news is not all bad, for the report goes on to say that given the nation's huge forest and rangelands and inland water base of 1.7 billion acres, we can meet nearly all demands for renewable resource products if we are willing to manage these resources more intensively. The environmental challenge of the 80's, therefore, is to do a better job of resource conservation, production, and management. Otherwise, our preservation achievements will not endure.

Specifically, then, what are the careers which fall within the category of natural resource management? Forestry, wildlife management, range science, and soil sciences are the major resource management fields. Each of these in turn is supported by other disciplines, including recreation, geology, landscape architecture, hydrology and a variety of engineering sciences.

The primary employers of resource management specialists are the government agencies including such federal agencies as the Soil Conservation Service, National Park Service, U.S. Forest Service, U.S. Fish and Wildlife Service and the Bureau of Land Management. Together these agencies are responsible for the protection and management of the roughly one-third of our nation's land that is in federal public ownership.

As an example of some specific federal agency opportunities, let me cite the federal bureau with which I, as a professional forester, am most familiar — the U.S. Forest Service of the Department of Agriculture.

The Forest Service is responsible for administering about 187 million acres of public lands which comprise the National Forest System. These public forests are located throughout the country, from New England to the Lake States, along the Appalachians into the deep South and throughout the Rocky Mountains and the Western States, including Southeastern Alaska.

Professional disciplines employed by the Forest Service in doing its job include:

Forestry: Managing timber and rangelands, planning timber sales and reforestation, managing wildlife habitat, and developing recreational opportunities.

Engineering: Surveying, map making, road and trail design, facility construction and maintenance, computer science, electronics and ecology.

Geology: Assessing soil capabilities, setting construction standards, making environmental assessments.

Hydrology: Water production and protection, flood control and soil protection, assessments of other activities on water quality and quantity.

Landscape Architecture: Design of recreational facilities, layout of transportation facilities, design of timber operations, environmental assessments.

Range Conservation: Protection of range resources, allocation of grazing for livestock and wildlife, assessing impacts of range resource use.

Wildlife Management: Inventory of wildlife and wildlife habitat, coordination of wildlife needs with other activities, environmental assessment of wildlife programs.

Soil Scientists: Soil inventories, soil protection, mapping, soil conservation measures.

Researchers: Improved tree genetics, integrated pest and disease control, fire prevention and control, economic analysis, and — in short — seeking better ways to do almost every aspect of managing the national forests.

The Bureau of Land Management within the U.S. Department of Interior is another federal agency responsible for the management of more than 400 million acres of public lands, mostly in the West and Alaska. Their work involves many of the same types of responsibilities as the Forest Service, and their need for trained resource managers and scientists is just as broad.

The National Park Service, the U.S. Fish and Wildlife Service and the Soil Conservation Service all have responsibility for the protection and management of public lands for a variety of purposes. Each of these agencies employs a broad array of specialists.

In addition to managing the national forests, the U.S. Forest Service has a major program of assistance to small private nonindustrial forest owners. These small landowners own almost 60 percent of our country's forested lands. Providing technical advice and assistance in all phases of good land management is a shared responsibility of the U.S. Forest Service and the various state forestry agencies.

Each state also has its own park and recreation programs, fish and wildlife agencies and environmental agencies, each requiring the talents of a wide variety of resource specialities. Many private consulting and landowning companies also offer good career opportunities to resource graduates.

To qualify as a professional in any of the resource management fields requires at least four years of full-time college or university training. Students who wish to specialize in a particular field, or to go into research or teaching usually continue on for graduate training or return to graduate school for additional degrees after gaining field experience. More than a hundred major colleges and universities throughout the country offer undergraduate and graduate programs in resource fields. An excellent list of such schools is contained in the *Conservation Directory,* published annually by the National Wildlife Federation and available in many high schools, colleges, and public libraries.

The various Federal land managing agencies and the several professional societies are excellent sources on information. Among the latter are: The Wildlife Society, 7101 Wisconsin Avenue, Washington, D.C., 20014; Society of American Foresters, 5400 Grosvenor Lane, Washington, D.C., 20014; and the American Fisheries Society, 5410 Grosvenor Lane, Washington, D.C., 20014.

One final word regarding natural resource management as a career: the number of recent graduates in these fields outnumber job openings. This situation has prevailed for several years and is likely to continue until the general economy of the country picks up. This means that competition for jobs is high. However, the student who does well in his or her studies and shows a willingness to accept a challenge, will seldom have difficulty in finding a job in his or her chosen field.

Lets face it. With our productive land base shrinking by several million acres yearly and our population increasing by two million people annually, we need all the good, bright, dedicated young land management professionals we can get.

PARTNERS FOR LIVABLE PLACES

by Robert McNulty

Robert McNulty is the president of Partners for Livable Places, a Washington, D.C., based national coalition concerned with the quality of design and planning in the built environment. Mr. McNulty received his BS in Business and Law Degree from the University of California, Berkeley. He is the co-editor of Neighborhood Conservation, published by the Whitney Library of Design.

Partners for Livable Places is a coalition organization about three years old. It acts primarily in the field of the built environment. We deal with the natural and man-made environment in terms of small towns, suburbs, and cities, through a broad range of issues. Our members are primarily professionals working in the field or civic associations with a track record of being a proven partner with government in getting things done at the local level. Their interests range from public housing to downtown economic development. Livability to us is really the end product of quality planning and design. It is what makes an environment a rewarding place, one that is economically productive and that provides a healthy environment in which to rear children.

What does Partners do? When members join, they make a commitment of their time for Partner service. I try to find local projects related to our work program and use the proven skills of members to help others help themselves. We try to work with people who have either economic power, political leadership, or vision for the future. Our membership ranges from national organizations like the Americans for Indian Opportunity to the New York State Urban Development Corporation. Some of our state groups are concerned with land

use issues, while many local groups like the Cincinnati Institute deal with arts and culture design quality. Thus we have a mix of small neighborhood associations, city, state, regional and national groups.

One of our members in Pittsburgh, the Pittsburgh History and Landmarks Foundation, was founded by an English teacher some 11 years ago. He was concerned that the city was tearing down a building which he thought should be preserved. Out of that has come an organization that has coalesced a number of interests in the city of Pittsburgh. They are now, as a non-profit group, one of the largest developers in the city, reinvesting their profits into subsidies for low-income home ownership. This organization is certainly a valid partner with government. Thus, we try to take people like Arthur Ziegler, the President of the Pittsburgh History and Landmarks Foundation, and introduce him to other people in different cities who have not yet realized that a non-profit partner can achieve impressive civic results.

Partners truly believe in partnership. When this country has both recession and inflation at the same time, we believe that doing business in the 80's must be done in a new way; partnerships of the public, private and civic sectors are a cost effective way to proceed.

A lot of work in our field is done on a volunteer basis. Most of our members are understaffed and underbudgeted. These group begin with concerned people giving of themselves and recruiting committed people as associates. When this applies to students, there is a direct return in terms of leadership experience, civic pride and practical know-how. Skills like communications become enhanced. Internships with the non-profit sector are a valuable source of experience for leadership to the individual and a great source of talent for civic groups. This is of mutual benefit, the best of all job possibilities.

RESOURCES FOR ENVIRONMENTAL CAREER EXPLORATION

by Thomas B. Grooms

Thomas Grooms has been the Executive Director of the Center for Environmental Education since 1979. The Center is a non-profit corporation established in 1972, to inform and educate people about environmental issues and to encourage citizen involvement in the improvement of environmental quality. Mr. Grooms holds a B.A. degree from De Pauw University, and J.D. from Georgetown University and a B.F.A., from the New School for Social Research and Parsons School of Design, in environmental design. Sharee Morris, a student intern at the Center, was instrumental in compiling this bibliography.

In my remarks opening the conference "Talent Development for Environmental Careers" I stated ". . . I believe our best resource for survival may well be the nation's youth — youth well educated for 'environmental literacy' . . . the commitment to environmental education must be expanded in all directions. . . "

The following information gives an idea of the wide range of opportunities young people now have to pursue "environmental literacy" in academic programs and in lifetimes careers. Many of the areas of study and work now called "environmental" have existed for many years under such names as "chemistry", "biology", "agriculture", "forestry", and "engineering". Only in recent years has "ecology" — the study of the interrelationships of organisms and their environments — become a popular field.

Environmental awareness, environmental action and environmental study have all intensified during the past ten years. New words

have been added to the language. New legislation and regulations controlling man's use of the environment, in ways only vaguely thought about before 1970, are now accepted as part of our life style. "Environmental Industries" have emerged with a full spectrum of career opportunities — old in scientific discipline, but thoroughly new in multidisciplinary approach.

The following bibliography, *Sources of Information for Environmental Careers*, appropriately includes references expressed in traditional terms and in the terms of the Environmental Decade of the 70's. In the belief ". . . that young people are a tremendous resource which should be tapped as soon as possible, to deal with the myriad of environmental problems which seem to be growing geometrically."

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Pamphlets Only

Careers Inc., Box 135, Largo, Florida 33540
- Agricultural Engineer S63
- Agricultural Research Careers B120
- Animal Physiologist S353
- Biochemist B101
- Biologists B26
- Botanist B112
- Civil Engineer B56
- County Agricultural Agent S108
- Earth Scientists B184
- Entomologist S45
- Forest Technician S24
- Forester B52
- Geologist S3
- Geophysicist B95
- Horticulturalist S132
- Ichthyologist S1
- Landscape Architect S2

Microbiologist S189
Mycologist S337
Nursery and Landscape Workers S37
Park Ranger S128
Plant Pathologist S72
Soil Conservationist S353
Wildlife Specialist B107
Wood and Forest Products Specialist S256
Zoologist S18

Chronicle Guidance Publications, Inc., Moravia, New York 13118
Agricultural Engineers OB156
Agronomists OB179
Biochemist OB132
Biologist OB344
Civil Engineers OB176
Conservation Officers
County Agricultural Agents OB177
Fisheries Scientsts OB190
Foresters OB88
Forestry Technicians OB283
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Horticulturalists OB203
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Landscape Architects S2
Landscape Gardeners OB451
Logging Industry Occupations OB416
Mining Engineers OB312
Mining Industry Occupations OB187
Nursery Managers OB99
Oceanographer OB200
Park Rangers OB120
Park Superintendent OB470
Petroleum Engineers OB197
Rangeland Specialists OB482
Recreation Occupations OB98

Soil Conservationist OB201
Soil Scientists OB276
Tree Experts (Arborist) OB291
Wood Technology Careers OB477

SRA, Inc., 155 N. Wacker Drive, Chicago, Illinois 60606
Agricultural Engineers No. 202
Biochemists No. 131
Botanist No. 294
Civil Engineers No. 2
Crop Scientist
Forest Technician No. 340
Foresters No.40
Geologists No. 184
Jobs in Marine Science
Landscape Architects No. 187
Mining Engineers No. 207
Oceanographers No. 188
Petroleum Engineers No. 208
Recreation Leaders No. 78
Soil Scientists No. 220
Wildlife Managers No. 149

Section IV

TDEC: MINORITY POTENTIALS AND PROGRAMS

INTRODUCTION

by Herb Alf

As documented in the following pages, minority cultures have more than talent to offer, they have the different perspectives needed to compose the whole of inquiry that we have discovered environmental career work to be. This is especially significant to our talent development intentions because of the international scope of environmental challenges. We need to utilize the full breadth of cultural diversity available to our training programs.

On another level, we need to assure minority accessibility to the new, environmental career fields as employment opportunity. Both needs can be addressed through appropriate talent development programs. I feel that we are fortunate in being afforded the following papers from two respected research sources of minority potentials and programs.

TDEC: OPPORTUNITIES FOR MINORITIES AND WOMEN

by Rosemary Davis

Rosemary Davis is a senior program manager for the Center for Systems and Program Development, Inc., a multi-disciplinary research firm based in Washington, D.C. This article is a review of the initial phase of an environmental careers model project Mrs. Davis directs.

The Center for Systems and Program Development, Inc., (CSPD), contracted with the office of Water Research and Technology (OWRT), Department of the Interior, to develop a comprehensive model for educating and training minorities and women in water research. A primary goal of CSPD's model is to provide a plan that would increase the pool of available minority and female personnel in the water research and technology field. A second objective is to heighten community awareness of the importance and impact of water policies on community decision-making. The achievement of these objectives could have several effects: (1) an expanded knowledge of career options; (2) the development of career models; and (3) more responsive water resource allocation.

The first major task completed by the CSPD research team was a report entitled *The National Status Report: Minority Education and Training in Water Research and Technology.* This report examined the role of minorities and women in water research and technology. Finding few minorities and women active in the field came as no surprise. Somewhat unexpected, however, was the extremely low visibility of the field and the difficulty of obtaining information on careers in water research and technology.

Minority and female representation in the sciences and water research careers is disproportionately low, although increasing num-

bers of minorities and women have begun entering the field. If equitable representation is to become a reality, the growth rate will have to increase substantially. This cannot occur until many more minority and female math and science majors enroll in college or technical schools.

The survey of curricula requirements for water research and technological careers revealed that basic skills are acquired at the elementary level, followed by more advanced studies and a variety of relevant enrichment electives in junior high school. The basic format of the Trent Commission continues to be followed, consisting of a combination of three years of mathematics and science. Students preparing for science careers are counseled to exceed this basic requirement. Research uncovered a number of exemplary water related secondary programs that could be replicated in other school systems.

Lack of adequate and concerted career counseling is one of the prime causes of minority underrepresentation in water related fields. Individuals become aware of careers between the ages of 9 and 11. By the senior high and freshman college years, many students have already made career choices or have followed courses of study that rule out advanced science or math curricula.

Career counseling for college freshmen, no matter how sincere and concerted, often comes too late. Scientific, technical, and water related career options should be presented as attractive career choices at the secondary school level and even earlier.

College counselors should work with recruitment and admission personnel to attract minorities and women to technical courses of study. Minority students frequently face problems that non-minority students seldom experience. To be effective, counselors, faculty, and other administrative personnel must work together to ensure that proper and adequate supportive measures are provided when needed.

Researchers for this study were able to locate several broad-based national organizations working to increase minority and female participation in the fields of science and engineering. Among these are the National Science Foundation, the Committee on Minorities in Engineering, and the Society of Women Engineers. Their efforts to attract and retain women and minorities in the field of science and engineering have achieved a certain amount of success. However,

long-term efforts need to be directed toward encouraging women and minorities in water research areas. Specific recommendations from this study include the following:

A more relevant cataloguing of water and other natural resource related occupations should be structured and adopted.

The new catalogue of natural-resource-related occupations should be adopted by major data collection sources, such as NCES, NSF, NIE and the Bureau of the Census.

Such a catalogue should be available to all persons involved in occupational guidance as a professional career.

Special efforts should be made to ensure that minorities and females receive the information contained in the catalog.

A massive public information campaign designed to acquaint the public with career opportunities in the above areas should be initiated. This effort should feature minorities and women prominently.

Each State school system should be encouraged to work toward improving performance and achievement in science and math at elementary and secondary schools..

Programs such as the Minority Institutions Science Improvement Program (MISIP) at NSF should be expanded to help fund science and math programs at the college level. Such programs should be developed for minorities and women at non-minority institutions.

Career counselors should develop intervention techniques to allay fears of minority and female students who lack the self-confidence to pursue science careers.

Counselors should be provided with data showing the increasing job opportunities, the occupational benefits, and the entrance requirements for careers in the water research and technological employment markets.

The private sector should become involved in providing

enrichment materials that would supplement the regular school curriculum.

The private sector should sponsor career days and trips to observe water research and technology personnel at work.

A listing of national as well as local water science umbrella organizations should be developed. These organizations should disseminate career information and encourage minority and female employment in water research and technology.

The overall conclusion of this report is that increased minority and female participation in water related careers is needed. Ways to bring about such an increase became the focus of the second major task — a detailed study of the problems and recommendations for change in one community.

CSPD conducted an in-depth survey of the Baltimore metropolitan community. A thorough initial examination of the suitability of the Baltimore site was made by the research team. The city (and surrounding areas) boasts a multi-ethnic mix, abundant water related natural resources, technical and educational training facilities, as well as the all-important potential for related employment. These findings supported the premise that Baltimore indeed offered opportunities for addressing the research questions.

The results of the Baltimore survey are contained in the report entitled. *Baltimore Community Survey: A Systems Approach for Assessing Minority Employment Potential in Water Related Science and Technology.* The research team concentrated on four (4) targeted systems in the Baltimore community: the political system, the social welfare system, the education system and the economic system. The systems approach was selected as the methodological choice for this study because it would best facilitate determining the interrelationships of the Baltimore community germane to this study.

Political System

Within the political system, public officials and community-based groups are generally unaware of the vital role that they can play in addressing some of the city's problems related to minority un-

employment and underemployment through the imaginative development of potential training and career opportunities in the city's water resource industry. Minority interest groups, whose constituencies have a stake in environmental issues, need to form coalitions to address such issues as the underrepresentation of minorities among elected and appointed public officials, and to develop strategies for the inclusion of minorities on policymaking boards and commissions concerned with minority education, minority employment and issues related to the environment. Well developed and implemented community action and better integration and coordination of already existing community services are only a few of the change options available to the forces at work within the political system.

Social Welfare System

Some of the same problems and recommendations are cited within a slightly different context in the social welfare system. In addition to the recommendations listed in the political system, the following options are particularly relevant to the social welfare system:

Establish a communications network between potential employers in the water industry and counselors in public and private social service agencies to keep counselors up to date about the employment outlook and training requirements.

Involve counselors from social service agencies in the job recruitment and retention programs aimed at the minority population.

Utilize such well-established environmentally oriented community organizations as Girl/Boy Scouts, 4H clubs, YMCA, YWCA, Campfire Girls, and church-sponsored youth groups to promote public awareness of water resource management and relevant career information.

Education System

Data for higher education revealed the continued underrepresentation of minorities in those fields of science and engineering that lead to water related careers. Minority students who do have a thorough

training in the basic skills and completion of two or more years of college preparatory math and science are eagerly sought by area colleges and universities. College admissions personnel noted the success of those applicants with appropriate preparation.

The Baltimore public and parochial schools provide comprehensive secondary academic programs. Two schools in particular, Polytechnic and Western, provide the greatest number of science majors who enter area colleges (Johns Hopkins specifically); science and engineering programs are available in all public and private universities for the academically successful students. It was found that academic and career counseling are needed to maximize the training potential that already exists in Baltimore for high achieving minority students.

On another level, two types of water related community-based education programs were surveyed. One type was located physically within local schools and administered by their resources (Maryland School-Community Centers and Multi-Service Centers). The other consisted of voluntary professional organizations with public interest missions which related to career counseling and water sciences technology. Programs of this type include the Chesapeake Bay Foundation, Youth Conservation Corps, Direct Search for Talent, and the Mathematics, Engineering, and Science Achievement Program (MESA).

Given the availability of water related science and engineering programs in the Baltimore community, why are there so few minorities represented in this area?

The major education/counseling factors that hinder minority representation in water research and technology careers in the Baltimore community stem from the following problems:

The weak knowledge base of some students in math, science, reading comprehension, and related skills;

The lack of a clear definition of water research and technology as an occupation field;

The lack of a well-developed, comprehensive water-related science curriculum;

Negative attitudes of some minority students toward math and science (due in part to similar attitudes expressed by some counselors and teachers);

Insufficient time allotted to counselors for purely counseling activities;

The lack of adequate numbers of targeted minorities enrolled in water-related community education programs.

As a result of the interviews and research in Baltimore, the CSPD education/counseling team determined that there are presently in place some programs and activities that address the question of increasing the number of minorities in water-related careers. The team recommends that certain additional methods for change be implemented:

Conduct comprehensive math and science inservice programs for elementary teachers in a nonthreatening setting;

Incorporate math and science-related concepts and activities throughout the academic curriculum;

Reinstate counselors in the Baltimore city elementary schools;

Identify potential candidates for water research and technology careers during the critical sixth, seventh, and eighth grade years;

Integrate isolated courses of study into a comprehensive water-related science curriculum (demonstrate the interdisciplinary nature of water-related studies and potential occupational points of entry);

Prepare a comprehensive water research and technology career manual.

Economic System

The general lack of knowledge about potential employment and preemployment opportunities for minorities in Baltimore's water resource industry has limited the development of recruiting, training,

and counseling programs geared toward minority employment in that industry. Better informed policymakers and activities within the economic system could be a vital force in the development of significant changes related to this problem.

The development, publication, and dissemination of directories or manuals that include listings of jobs and job qualifications at all levels in water research and technology, better communication between career counselors and the industrial sector, and a more imaginative use of CETA and other manpower programs are among the many suggestions that could lead to the greater employment of minorities in the Baltimore water industry.

Water Research and Technology Advisory Council

A Water Research and Technology Advisory Council should be established in order to initiate the implementation of the Comprehensive Model for the Education and Training of Minorities in Water Research and Technology. This Council would utilize the problems and recommendations set forth in the change options report as a guide. The Council would consist of representatives from each of the city's targeted systems who have the expertise and authority to bring about the desired changes. A team to provide technical assistance would also be established to coordinate and monitor the implementation of the model.

The interrelated nature of both the problems and the recommendations for change is apparent throughout the study. Paramount among the problems identified in all of the systems were the two problems of the low visibility of water science and technology as an occupational field and, closely related, the difficulty of obtaining information about careers and entry level requirements in this field. A well-organized public information campaign needs to be developed and directed toward not only those change agents specified within the systems, but also toward the minority population in general to inform them about the importance of water resources to the community and the job opportunities that exist in the field of water research and technology.

TDEC: PROGRAMS FOR MINORITY STUDENTS

by Jean Durning

Jean Durning has directed Urban Environment Foundation work (now the Human Environment Center) on minority entry into environmental and natural resource professions since 1978. Prior to this, she was a teacher at the secondary and adult level in three separate metropolitan areas. She did her undergraduate work at Oberlin College and Fisk University, and received an M.A. from Yale University.

Why should career education for minority students be a topic at a conference focused on talent development?

A quick answer might be that any minority person who has overcome all the barriers of American society to become a professional in environmental fields must be, by definition, exceptionally talented — both in intelligence and in willpower and tenacity. Certainly, there is a widely held belief among minority people that to reach the same position as a white Anglo male, in whatever field, one must be twice as competent.

But more than that, all programs should pay attention to accessibility for minorities. And some environmental problems that affect minority communities particularly poor communities, have not been adequately addressed: Breathing high concentrations of lead in the air, from automobiles on congested streets, is damaging the learning abilities of some inner-city children. Families who supplement their groceries by fishing in dirty lakes or rivers may be eating dangerous contaminants. Improper use of pesticides is a real worry for Chicano and other farm workers. A lack of enforcement of hunting laws in rural black areas means some of these areas are now bereft of game. Indian reservations have been despoiled by the irresponsible forestry and mining practices of some contractors. Noise, garbage, and pests

add to the stresses of poverty and discrimination. Perhaps, these concerns will be most seriously addressed when minority professionals participate fully in the leadership and protection of the environment, as well as the management of natural resources.

How can a young minority person learn about careers that are concerned with improving the environment? For that matter, how can any young person explore these new or less visible professions?

In investigating career education in environmental fields for minority students, I have learned about several programs, three of which I would like to describe.

Chicago Career Development Center

Perhaps the most explicit such effort I have run across is the Career Development Center for Environment and Energy Management Studies of the Chicago Public School system, coordinated by Frances S. Vandervoort. This center is one of thirteen serving Chicago high school juniors who wish to investigate future career possibilities. The Career Development Center Network is part of the Chicago Board of Education's program for voluntary desegregation, called Access to Excellence. As such, the make-up of each class is 40% White, 40% Black, and 15% Hispanic, with 5% reserved for other minorities or administrative option. Each class has approximately equal numbers of young men and women.

Students apply for the program after learning about it from a guidance counselor or vocational education teacher in their home high school, or through the outreach efforts of the career development center teacher. Students are selected on the basis of interest as well as ethnic balance.

The Career Development Center for Environment and Energy has one class per semester of perhaps 25 students, who spend their entire school day on career exploration. The program's goals for its students include development of decision-making skills, recognition and development of environmental values and ethics, recognition and development of personal values, and development of a work ethic.

Most students who enroll in this Center have little background in issues related to energy or the environment; therefore, early in the semester they study concepts of ecology and energy and energy

systems. For this and other work, students receive one and a half science credits.

Following this, each student surveys a neighborhood in his/her political ward of Chicago for its environmental problems. Ms. Vandervoort states that the oral reports on survey findings are of great interest to others in the class. "Invariably students are fascinated by their classmates' accounts of neighborhoods other than their own. They are often amazed to find that problems of litter, poor park maintenance, and vandalism are problems of the entire city, not just of their own neighborhood."

Time is then spent on the study of particular topics. In small groups, or sometimes individually, students work on their chosen topics, following Module Study Guides and the contracts they draw up with the teacher. Study guides developed and copyrighted included Air Quality, Solid Waste Management, Wastewater Management, Floodplain Management, and Solar Heating. In addition, Ms. Vandervoort has developed modules entitled Urban Space, Trees, Lake Michigan, and Urban Animals. Each study module is intended to increase student's understanding of specific environmental problems and to introduce them to the kinds of jobs involved in tackling those problems.

Occasionally, a student develops his own plan of study. Two examples of these are an investigation of radioactivity in the urban environment, and an exploration of the role of news media in environmental management (i.e., how reporters and commentators influence public awareness and action in environmental problems).

Each module requires considerable amount of time out in the community investigating the topic. For example, in studying air quality, students choose one industry for investigation, and in addition to library research, they interview appropriate personnel in that industry. (Suggested questions to start the interviews are given in the study guide.) Students record information on the environmental or energy management problem. They also keep a log of job titles they encounter and determine the qualifications (including educational) needed for these positions, plus current salary ranges of job categories.

The final step of each study module is some sort of presentation so

that information gathered may be shared with other members of the class. Ms. Vandervoort concludes, "Students . . . learn that although the environmental problems of the city are serious, they are not insoluble."

Akron Exploratory Program

A different sort of career awareness curriculum for high school students has been developed in the Akron (Ohio) Public Schools. This is the Environmental Sciences Career Exploratory Program for College-Bound Students. Instead of a full-time, one semester program, Akron students apply for enrollment in Buchtell-University High School for their entire senior high period. Tenth graders take, in addition to regular academic classes, a broad survey course covering at least four of the seven career clusters featured at this high school. Then, in eleventh and twelfth grade, students concentrate on one of these career clusters during three class periods per day.

During this block of time students take academic courses in two related subjects (in the Environmental Cluster, chemistry and environmental science) plus career guidance and exploratory experience. The exploratory experiences include guest speakers, field trips to job sites, and practical experience. A working partnership with the University of Akron makes available University personnel and facilities for enrichment activities.

Career fields suggested to students in the Environmental Science cluster include Biochemistry, Forestry, Geology, Hydrology, Pollution Analysis, Soil Conservation, Urban Planning, Water Analysis, Environmental Engineering, Environmental Health, Industrial Sanitation Landscape Architecture, Sanitation Engineering, and Zoo Management. Special features of this program include trips to look at the environment in Ohio, the Great Lakes region and Appalachia, including on-site study of problems created by strip mining. An after school program which includes overnight camping trips, called Wilderness Experience, provides an opportunity to study geography, geology, ornithology, and botany.

Outward Bound Adventures

A quite different program is conducted by a group in Pasadena, California, called Outward Bound Adventures (no relation to the organization called Outward Bound). Career education is only one of the objectives of this program, which introduces teenagers from high-tension, low-income areas of Los Angeles County to the outdoors in an extensive program of field trips. The program includes one-day mountain hikes or study trips to beach tidepools and extended High Sierra backpacking or car caravan excursions to Death Valley.

The volunteers and credentialled teachers who run this program have found that children who rebel against school regimens can learn almost anything in the out-of-doors. The enthusiasm of their longtime leader, Mary Helen Williams, must be contagious. Outward Bound Adventures has been very successful in helping young people recognize the interrelationships of all living things and the value of our earth's resources.

The career awareness aspects of the program have involved the cooperation of such agencies as the U.S. Forest Service, the California Department of Parks and Recreation, California Fish and Game Department, the Sierra Club and the National Audubon Society. Activities have ranged from visiting a fish hatchery to a major project of building a nature trail for the blind or physically handicapped.

The career study program emphasizes land management and conservation careers in a year-long program for selected students in junior and senior high schools. Each month there is an outdoor field activity of one to four days, with orientation and follow-up meetings of students at their schools. In addition to work with agencies and projects mentioned, they have scheduled investigation of careers in water resources, urban pollution and urban planning, oceanography, biology, and archaeology. Counseling is incorporated into the program to help students develop realistic goals and to master interpersonal and work skills.

Outward Bound Adventures has arranged a limited number of summer jobs with the California Department of Parks and Recreation and the U.S. Forest Service. In addition, a few students have summer

scholarships to the Teton Science School in Wyoming or other environmental schools.

Outward Bound Adventures also runs an Upward Bound Program — one of the extremely few Upward Bounds not directly connected with a university. This program is for students with college potential who need encouragement, tutoring and financial counseling to help them fulfill that potential.

These, then, are three samples to consider as we work out model high school programs for career exploration in environment fields: (1) a one-semester full time program, (2) a two-year program using about one period per day, and (3) a program made up almost entirely of field trips. Eachof these programs presents an outlet for minority students to select a life work that helps make this world cleaner and healthier for their own neighbors and for all humanity.

Section V

CENTRAL FEDERAL ENVIRONMENTAL PROGRAMS

INTRODUCTION

by Herb Alf

The title intends to establish that, of the many federal agencies with environmental programs, the agencies carrying the major environmental responsibilities address us here. The agencies referred to are: The Council on Environmental Quality and the Environmental Protection Agency.

As the U.S. President's information gathering and advisory body on environmental affairs, the Council on Environmental Quality honors our effort with this special report in support of our talent development thrust. A vital connection is established with the opportunity to hear from the President's Council and learn how it relates to the needs and aspirations we have as environmental program builders.

The report of the Environmental Protection Agency is specifically oriented to bring information of value to persons seeking direction and support in environmental education and talent development for environmental careers. There are no pie-in-the-sky promises offered. Rather, we receive objective descriptions of existing governmental initiatives, funding limitations, and unanswered concerns. On a bread and butter level, we get such detail as where to write to for a catalog of funding possibilities for student support and environmental education.

THE ROLE OF THE COUNCIL ON ENVIRONMENTAL QUALITY

by Bryan Baas

Bryan Baas joined the Council on Environmental Quality in 1979, as a Senior Advisor for International Affairs. The council is an advisory body to the President and has oversight responsibility for the national environmental policy act (NEPA).

He attended the University of Texas, graduating with a BBA in International Trade and Economics. He subsequently joined the United States Foreign Service and served in Kabul, Bagdad, Beirut, London, Dublin, and the State Department in Washington.

The Council on Environmental Quality (CEQ) is one of the smallest offices in the U.S. Government. It consist of three members appointed by the President and an authorized staff of thirty-two permanent and seventeen temporary employees. In addition, there are as many as twelve student interns during the year. The Council is an integral part of the Executive Office of the President, and the Chairman, Gus Speth, attends the President's Cabinet meetings as well as the White House Senior Staff meetings. The participation in these meetings is not merely a formality; the President and the Executive office are concerned about environmental issues, and CEQ's views are taken into consideration when policies are formulated.

The staff at CEQ is divided into legal and program specialties. The legal staff prepares regulations, provides interpretations of the National Environmental Policy Act (NEPA) and continuously reviews federal environmental laws. The program staff is responsible for the full range of environmental sciences, and the major divisions in

CEQ are Environment, Land Use and Wildlife, Natural Resources, Economics and Pollution Control, Energy and Resource Recovery, and Environmental Health and Toxic Substances. The specialists in these divisions — ordinarily scientists with Ph.D's — must keep abreast of developments in and out of government and must continuously advise the Council members on environmental problems. This means staying in close contact with a wide range of private organizations as well as with other government offices.

Public contact and communications are extremely important. Effective government response to environmental problems depends on public support. The CEQ needs to have information on which to base policy recommendations to the President, and at the same time we want to keep the public informed and involved. Among CEQ's information activities is a "brown bag" lunch every other Thursday at which members of the public can discuss with the Council and staff matters of environmental concern.

The CEQ's mandate derives from the National Environmental Policy Act of 1969 which sets forth a number of specific responsibilities, one of the most important being that of developing and recommending to the President national policies "to foster and promote the improvement of environmental quality to meet the conservation, social, economic, health, and other requirements and goals of the Nation." Other CEQ responsibilities include drafting the President's Environmental Message to the Congress, preparing the annual report on the state of the environment, conducting and contracting for research relating to ecological systems and environmental quality, general oversight of NEPA for all proposals for legislation, and other major Federal actions significantly affecting the quality of the human environment. By executive order the EIS process has been extended to the international arena, and proposed Federal actions affecting the international environment must be accompanied by such a statement.

These are very general descriptions of what the Council does. A few examples might give you a better idea. In his 1977 Environmental Message the President pointed out that there were seven different federal agencies working under at least a dozen major statutes, which addressed the problem of toxic substances in different ways. He said that we needed integrated implementation of legislation on toxic

substances, and he directed that a Toxic Substances Strategy Committee be established under the chairmanship of the CEQ. The result was an in-depth study and a report, recently released, that made a number of important findings and recommendations. In his 1979 Environmental Message, the President said that integrated pest management (IPM) has both economic and environmental benefits and should be encouraged. He then directed the establishment of an interagency coordinating committee, again chaired by CEQ, to assure the implementation of his IPM directive.

In other cases the CEQ takes the initiative when it perceives a failure to comply with NEPA policy or when it decides an environmental problem should receive more attention. For example, our land use staff learned that another department was contributing to a large development project without having prepared an EIS. We immediately called it to their attention, and the EIS is now being prepared. In another case, CEQ is attempting to draw the attention of policymakers to the potentially serious problems of increasing carbon dioxide concentrations in the atmosphere, the implications of which are not well understood. Another activity is that of publishing reports on subjects of environmental interest as diverse as wildlife in America and the effects of off-road vehicles on public land. In short, CEQ is concerned with the protection of the environment in the broadest sense of the word.

In recent years there has been increasing public awareness of the importance of the global environment to our long-term well being. There is also, as you know, frequent resistance to environmental protection measures. I think it is clear that environmental problems will continue to increase in magnitude and complexity, particularly in the face of increasing population and its demands on diminishing resources. Thus, I believe the importance of environmental protection as an element of national policy will grow, and with it will grow the scope for careers in environmental fields.

TDEC: THE ENVIRONMENTAL PROTECTION AGENCY

by Jeff Meetre

Jeff Meetre has been a manpower development specialist in the Workforce Development Staff on the Environmental Protection Agency since 1974. He is responsible for planning and writing education materials on EPA plans and programs. Mr. Meetre graduated with a B.S. degree in Economics from the University of Maryland.

I'm Jeff Meetre from the U.S. Environmental Protection Agency. Until Fiscal Year 1979 we had three fellowship programs in the Environmental Agency: one in air, one in waste water and one in drinking water. In 1979 the program in air was discontinued, but the fellowship programs in wastewater and drinking water are still operating. Each of these fellowship programs is designed primarily to support the training of employees working at State and local pollution control agencies. These fellowships are designed to improve the ability of State and local agencies to conduct pollution control programs — they aren't designed to improve general environmental learning. In fact, the fellowships are awarded through state and local pollution control agencies rather than directly to students.

EPA does not issue many fellowships. Both the wastewater program and the drinking water program issue approximately one full-time equivalent student per state.

I get a lot of calls from students asking: Do you have any fellowship programs for me? Since the small number of EPA fellowships are awarded to persons already employed in pollution control agencies, most of the students who write to me are ineligible. In order to be as helpful as possible, however, I have put together a list of federal

student support programs. You can write to me at my office if you would like a copy. I assembled the list by going through the *Catalog of Federal Domestic Assistance* and identifying programs that in my judgment, although not designed specifically to support students in environmental studies, nevertheless have the potential of supporting students in academic fields, such as engineering and science, that contribute to environmental protection.

EPA is primarily a regulatory agency, and most of the support that we give has the purpose of helping state and local agencies develop their own pollution control programs. Our research and development programs are intended to support the development of regulations and to support the development of techniques for meeting pollution standards.

Although I receive many thoughtful environmental education proposals from universities, nature centers, school teachers, and so forth, I do not have any money to fund them. As I did in compiling the list of federal student support programs, I have reviewed the *Catalog of Federal Domestic Assistance* and extracted the programs that I thought had the potential of supporting the environmental education proposals that I receive in my office. Anyone wishing to have a copy, or wishing to have extra copies of the student support list, can get one by writing to me at the following address: Jeff Meetre (RD-680), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460. My phone number is (202) 426-8882. Just ask for my list of federal grant programs or student support programs.

In mailing out copies of the list, I frequently ask the person seeking funds to let me know if the list is helpful to him or her in seeking financial support for environmental education projects. Does the list help them get federal grants? No one ever writes back. I don't know if that means that they don't care about me once they get funded, or if it just means they don't get funded. But to my knowledge the list is the best available reference for persons seeking support for environmental education projects, and it is an excellent document for a person to use in studying the federal government.

I get many inquiries from students, teachers,and counselors interested in environmental protection careers. My impression, based on my experience at EPA, is that environmental protection is more of

a program than it is a career field. It is a program that utilizes persons from many career fields: chemistry, biology, zoology, urban planning, engineering, geology, meteorology, audiology, teaching, administration, law, entomology, soil science, physiology, oceanography, epidemiology, toxicology, and others. In addition, occupations such as economics and business administration make important contributions even though protecting the environment is not the main purpose of these occupations.

Environmental protection, then, is not really a new field. It is as old as the occupations mentioned. What is new is the emphasis on environmental protection and the sophistication of the new approaches to environmental protection.

I advise students to avoid over-specializing. Officials from state and local pollution control agencies have told me, for example, that they would prefer to hire mechanical engineers rather than hire environmental engineers. They feel that undergraduate programs should concentrate on teaching basic engineering concepts and that students wishing to specialize in environmental engineering should do so at the graduate level. Their reasoning is that they can train students to apply their engineering skills to environmental problems themselves.

Another thing to keep in mind in advising students is that the market for environmental jobs is very tight. By studying traditional academic subjects students can hold open more career options than they can by specializing in environmental subjects at the undergraduate level. A person with a degree in mechanical engineering or chemistry will be in a much better position to find a job than will a person with a degree in environmental engineering or environmental studies, in the event that there are no jobs as environmental engineers or environmental protection specialists. Also, the person with a degree in environmental studies or environmental engineering would have more trouble changing jobs later on than would the person with a background in environmental engineering or chemistry.

I know that others may disagree with me. But I feel that we are failing students if we encourage them to enroll in environmental studies programs without understanding that many, many career fields provide an opportunity to contribute to the environment, and

that in many cases students will have a much wider range of career opportunities if, at the undergraduate level, they concentrate on traditional studies. This doesn't apply to everyone. For some persons an environmental studies program is most appropriate. Even for those persons, however, I think we should make it clear that there is a tight market for environmental jobs.

Section VI

FEDERAL TALENT DEVELOPMENT PROGRAMS

INTRODUCTION

by Herb Alf

The need to increase environmental talent resources relates to all education programs, nevertheless, the first TDEC conference objective was to build bridges between environmental career opportunity and present talent development programs. That is why our first conference sought to bring together leaders of career education, environmental education, environmental action, and education of the gifted and talented. It seemed most important and most opportune to open liaison between programs that were already receiving funding. And, for the sought talent, it seemed most appropriate to relate, firstly, to existing programs for the gifted and talented.

The following presentations provide information on present funding possibilities for environmental talent development. Part of the enthusiasm for the potential of our first conference derived from the fact that programs for the gifted had recently received increased funding from Congress. It made good sense to work to bring the new funding for the gifted into closer working relationship with funding for career development and environmental action. The key information that encouraged us is reported here along with other pertinent information on federal programs for talent development.

GIFTED AND TALENTED LEGISLATIVE PERSPECTIVE

by Nancy Nirider

Nancy Nirider is the legislative assistant to Congressman Carl Pursell (R-MI) of the 2nd Congressional District of Michigan. She holds a B.A. in political science from Michigan State University and is currently attending the University of Baltimore School of Law, evening division.

Legislatively, the most significant catalyst for increased interest in programs for gifted and talented children was the 1969 Amendements to the Elementary and Secondary Education Act. The Act defined "gifted and talented" for purposes of federal education programs and called for a study to be made by the Commissioner of Education to assess and evaluate federal education assistance programs being used to meet the needs of the gifted and talented. The study was also meant to outline and recommend what, if any, new programs were needed to reach these unique students.

The study — one that is landmark — is now known as the Marland Report of 1972, named after the then Commissioner of Education, Sidney P. Marland, Jr., based on data collected from all 50 states, it strongly suggested that intellectual and creative talent cannot survive educational neglect and apathy.

It estimated that 3-5% of the school population can be called "gifted" under the 1969 definition. That translates into 2.5 to 5 million elementary and secondary students in the U.S. today.

The Marland study also stated that existing services to gifted and talented children were not reaching subpopulation groups such as minorities and disadvantaged. I believe this is to be an important and major point of focus for future projects for the gifted.

Commissioner Marland's report also pointed out that differentiated education for the gifted was perceived as a very low priority at federal, state and local government levels. The federal role in 1972, in delivery of services to the gifted, was all but non-existent. Yet, state and local education agencies looked to the federal government for leadership in this education area.

Finally, and importantly, when services to gifted and talented children were provided, significant and measureable outcomes were evident.

What has Happened to Gifted Programs at the Federal Level

It was not until 1974 and the passage of the Education Amendments of that year that specific authorizations were provided for gifted and talented programs. Under Title IV Special Projects of that act, provisions mandated the Commissioner of Education to designate an administrative unit to administer the new program and to establish a clearinghouse to disseminate information on the gifted. The administrative unit became the Office of Gifted and Talented. Grants were also authorized under the act for the establishment of model projects.

Appropriations for the 1974 Gifted legislation began in Fiscal Year 1974 at $2.56 million. This amount was then subdivided by the Office of Education for the specific functions of grants for training, planning, development, and maintenance of new programs. From 1974 through 1977 federal appropriations for gifted and talented programs remained near the $2.5 million level.

In March, 1978, Congressman Carl Pursell introduced the Gifted and Talented Children's Education Act of 1978. Soon after his initial introduction of the Gifted and Talented Act, H.R. 11533, he offered and won approval of the bill as an amendment to the Elementary and Secondary Education Act of 1978. The amendment was adopted by the full house and subsequently enacted, with the help of Senator Jacob Javits on the Senate side, whose work and support was essential.

The Gifted and Talented Act, which is now a part of Public Law 95-561, has the following characteristics:

First, it acknowledges the appropriateness of a continuing federal role, in two basic ways. One, by encouraging further efforts by state and local education agencies, and two, by giving a modest level of federal monetary support.

Second, with the realities of the available monies, the bill changes the existing structure of the gifted and talented program by targeting the limited federal dollars as close as possible to the actual instructional environment of the children to be served.

Third, the bill rejects the notion of a federal response to the total universe of gifted and talented and instead responds to practical instruction reality, namely children assessed by the school system as gifted and talented.

The bill authorized $10 million for Fiscal Year 1979, $15 million for 1980, $20 million for 1981, $25 million for 1982 and $25 million for 1983.

Additionally, a provision for the economically disadvantaged child — inspired by Congresswoman Shirley Chishsolm — is included in the act and addresses another of the points listed in the Marland Report. Fifty percent of all local educational agency projects must include a component for the disadvantaged gifted and talented student.

The most important part of the legislative process — appropriations — was yet to follow.

Congressman Pursell was named to the House Appropriations Committee at the beginning of the 96th Congress in January of 1979. Although he had to give up his seat on the Education and Labor Committee, he was fortunate in being named to the Labor/HEW Appropriations Subcommittee where funding for gifted and talented is contained. The work completed thus far by the Appropriations Committee is for the new Fiscal Year budget.

In the President's 1980 Budget Request, President Carter chose not to fund the newly authorized program of assistance to states and local school districts. Rather, he proposed continuation of demonstration projects at the FY 1979 level of $3.78 million.

However, through a Pursell Amendment in the Labor/HEW Subcommittee action, $6.28 million was approved to fund the Gifted and

Talented Act for 1980 under Title IX, Pt. A of the Elementary and Secondary Education Act. This amendment was enacted in the FY 1980 appropriation bill.

Under the 1980 appropriations, 75% of the gifted funds, or $4.71 million, must be in the form of grants to states, of which 90% of $4.24 million must be passed to local school districts in the form of competitive grants. The remaining 25% or $1.57 million is to be retained by the Commissioner of Education to be used in a manner similar to the present 1979 program of demonstration projects.

During the hearings on the 1980 Budget there were reports that a reorganization would disperse the Office of Gifted and Talented's functions among the divisions of the Bureau of Education for the Handicapped. Report language was included in the 1980 Labor/HEW Appropriations to urge that the Office of Gifted and Talented be maintained.

That brings us up to date. Yet developments in the next few months and years will be critical to the future of gifted programs. There will be a yearly funding battle for the federal initiatives in all education programs, much less gifted and talented. Threats of Administrative reprogramming of funds committed to gifted programs looms whenever a crunch hits another, albeit, important project.

The biggest task facing proponents of developing the talents of these special children is to make gifted programs a priority in our greatest national investment — education.

TDEC: THE NATIONAL SCIENCE FOUNDATION

by Mary Kohlerman

Mary Kohlerman joined the National Science Foundation in 1970, and is currently the program manager of the student science training program. She holds a B.A. in Chemistry from Seton Hall College and an M.S. in Chemistry from the University of Notre Dame.

A program conducted by the National Science Foundation which offers some opportunities for "Talent Development for Environmental Careers" is the Student Science Training (SST) program. The objectives of this Foundation activity are: to provide unique science education opportunities for talented high school students; to allow participants to come into direct contact with college faculty and research scientists; and to bring the instructional resources of universities, colleges, and research organizations into the academic preparation of talented students significantly earlier than the education system ordinarily permits. It is the hope of the SST program that the above opportunities will help students to assess career choices at an early stage in their development.

Colleges, universities and other appropriate organizations are funded by the SST program to conduct either summer or academic year projects. It is the project directors at these institutions who recruit and select participants. Generally required for application to the projects are PSAT scores, high school faculty recommendations, transcripts, and frequently a student essay describing his/her interest in the sciences.

Proposals from the institutions are accepted once a year by the Foundation. We receive approximately 350 requests a year and are able to fund approximately 115 projects which can accommodate

some 4,400 students. The majority of projects are designed for students between the 11th and 12th grade, while a smaller number are designed for students in grades 7-9.

The junior high programs were just initiated in 1979. It seems that students at the junior high level frequently do not have many opportunities for instruction in the sciences and/or are not aware of the courses they should pursue in high school if they choose to continue in a scientific career. We hope that SST opportunities for the early adolescent will begin to alleviate this problem.

During this past year, 25 of the SST projects focused on environmental education. I would like to describe a few of these briefly.

A project at the University of Iowa was specifically planned for the physically handicapped. Participants included students who were blind, deaf, or suffering from muscular dystrophy. The first three weeks of the project were spent in teaching the students to use monitoring devices appropriate for environmental studies and in acquainting them with the area of study. During the last three weeks of the project, students and staff spent their time on camping trips to allow the participants to do actual field work. Objectives of the project included making the handicapped student aware of his/her capabilities, and educating the public about the abilities of the handicapped in the areas of science.

The Foundation for Glacier and Environmental Research involved high school students as research participants in their work on the Juneau Icefield in Alaska. Among the program's objectives was helping the student learn research techniques and concepts as a basis for understanding and helping in today's resource management challenges and related environmental issues.

At the University of Wisconsin-Superior, 29 high ability high school students from eleven states undertook activities to study the multidisciplinary aspects of fresh water analysis in order to gain a better understanding of the varied problems associated with our most important natural resource.

A project at Middlebury College in Vermont was designed specifically for inner-city youth who might have little opportunity for field-oriented studies. The four weeks of instruction/research activities concentrated on the study of shallow and deep water sedimen-

tary rocks, field mapping, and some study of surficial geology.

As a last example, I will mention a project at Indiana State University in Terre Haute. The two main objectives of the Terre Haute program were to introduce talented high school juniors to the unique potential of the Landsat satellite system and to use the various remote sensing techniques for delineating coal strip mine areas in Indiana. As a consequence, the students increased their awareness of a variety of environmental problems and gained insight into the contribution that remote sensing is making to solve problems of national concern.

I would like to point out that the Foundation publishes a Directory each year listing the SST projects and names and addresses of the project directors. We mail this Directory to approximately 100,000 high school principals, counselors, and science teachers. Individuals may obtain a copy on request from the Student Science Training Program at the National Science Foundation, Washington, D.C. 20550.

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ABSTRACT

Research on the use of calculators in mathematics classes is reviewed. It is noted that calculators were initially too high-priced and of too low an availability to be viewed in terms of widespread use in classrooms. Technological and manufacturing advances have since made wide use possible. Proponents of calculator use see this technology as a learning aid that has the potential to increase student motivation levels and improve mathematics achievement. Some opponents are concerned that too early an introduction to calculators could keep pupils from learning and understanding some basic mathematical skills. Findings from many studies reflecting aspects of calculator usage are presented. The document concludes by noting that while the controversy over calculator use will continue, some generally accepted conclusions seem to exist. Among these is the idea that calculator use in mathematics classes prior to the junior high school level is ill-advised, since pupils in this group are still learning basic skills. Second, use of calculators by students of below-average ability appears ill-advised. Finally, it appears calculator use does aid pupils in logically planning approaches to problem solutions. (MP)

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THE USE OF HAND-HELD CALCULATORS IN SCHOOLS: A REVIEW

by Steven G. Neubauer

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Ever since calculators have become accessible to the majority of the population, the question has always risen as to the effects of their use in the mathematics classes. Originally, the high prices and the low availability of the calculator postponed this potential arguement. But through technological and manufacturing advances the inevitable became reality and the question had to be dealt with.

Among the issues being considered were the following questions. Should calculators be allowed in mathematics classes? Should all ability levels be entitled to use calculators? At what age level should calculators be introduced? What will be the effect of using calculators on the student's mathematical achievement?

Proponents of calculators, according to Quinn (1976), praised the calculator as being a learning aid for mathematics classes that is capable of increasing the motivational level of the student. They added that a direct result of increased motivation would be the improvement of the student's mathematical achievement by enabling the student to understand the logic of problem solving. This would be particularly evident when coping with complex, multiple step problems similar to the ones which confront the student everyday.

Even the National Council of Teachers of Mathematics endorsed the use of calculators in the classroom with this position statement in 1974 (N.C.T.M.):

> With the decrease in the cost of the minicalculator, its accessibility to the students at all levels is increasing rapidly. Mathematics teachers should recognize the potential contribution of this calculator as a valuable instructional aid. In the classroom, the minicalculator should be used in imaginative ways to reinforce learning and to motivate the learner as he becomes proficient in mathematics(p.3).

Harrington (1976) also agreed that the use of calculators could greatly reduce the tedious arithmetic pencil-paper work while at the same time reinforcing the basic mathematical concepts.

However, according to Quinn (1976), critics hypothesized that any replacement of the pencil-paper mode of computation by calculators would cause serious deterioration in the student's ability to compute manually. In other words, they would become calculator illiterates.

Based on the findings of Nation's Schools and Colleges (1974) critics argued that students at the elementary level risk becoming so dependent on calculators that they may forget or even fail to learn the basics of computational skills. As Professor James McKinney says,"I can't think of any reason why a fourth or fifth grader should even see one, after all, that's when we're trying to teach them the basics of arithmetic(p.12)."

Finally, Hawthorne (1973) theorized that if calculators were introduced too early in the student's schooling, before the child has some familiarity with the basics of arithmetic, then calculators could do great harm in terms of ability development. If the students do not know how the answers were obtained, then calculators do not help the students gain those basic skills which are accepted as being necessary.

The reviews by Crockett (1978) and Ferguson (1976) of the ACT scores of high school juniors shows some statistical evidence that mathematical achievement of students is declining. The average scores on the exam reached their peak of 19.6 in 1964.

The average mathematics scores have been steadily dropping since then to their 1976 average of 17.1 out of a possible of 36. The 1977 average score was 16.8. One of Crockett's (1978) conclusions was that students of today are becoming academically weaker and showed some factual evidence to support this claim. Ferguson (1976) feels that, based on a study by Munday, there is good cause to consider the lower developed academic abilities as a partial reason for the decline. Possibly, both of these statements indicate that this weakness is due in part to the use of calculators.

But Roberts (1980) provides evidence to dispute this notion. He reports on ten investigations made at the college level. In one, done by Sosebee and Walsh in 1975, the ACT scores of the calculator users in chemistry were compared to the ACT scores of non-calculator users in chemistry. They found no statistically significant difference. In another study by Smith in 1977, the ACT scores were analyzed for the sample used. This study was to determine the achievement and attitudinal impacts of calculators. Again there was no statistically significant difference. In 7 of 8 studies there were computational benefits reported due to the use of calculators but only 2 of 3 studies reported conceptual benefits due to the use of calculators.

A study was done by Ladd (1974) to determine whether the use of calculators in class offered an effective remedy for the lack of success in the low achievers. He measured the mathematics achievement on the Cooperative Mathematics Test Form Y for ninth graders. Two groups were formed by randomly scheduling 201 low

achievers into 1 of 5 control groups or 1 of 5 experimental groups. The control groups used only paper and pencil while the experimental groups used calculators. The difference between the posttest mean score of the control groups and the posttest mean score of the experimental groups proved to be not statistically significant.

In another study by Mastbaum (1969) the effectiveness of calculators vs. computational skills kits on the mathematics achievement of seventh and eighth graders with low achievement was researched. The study randomly placed 87 seventh grade low achievers and 84 eighth grade low achievers into four groups. These groups were: T1- basic text and calculators; T2- basic text and skills kits; T3- basic text with calculators and skills kits; T4- basic text only. The achievement of the four groups was measured by pretest and posttest using the different forms of the Cooperative Arithmetic Test. The primary finding of the research was that the use of a calculator as a teaching aid for slow learners does not significantly improve mathematic ability, computation skills, mastery of concepts, nor the ability to solve mathematics problems.

The study by Moser (1979) to determine the effect of calculator supplemented instruction on arithmetic achievement of second and third graders also showed no statistically significant difference in the achievement scores when measured on an experimentor-made test.

Nation's Schools and Colleges (1974) reports on a study done in East Greenbush, New York, in which 55 sixth grade low, middle,

and high ability students were placed into a control group which did not use calculators or into an experimental group which did use calculators. The results of this study showed the experimental group which did use calculators attained higher computational and higher achievement scores than the control group which did not use calculators. The report further showed that the experimental group scored an average 2.3 more correct answers than the control group on a 67 question exam when neither group was allowed to use the calculators.

Creswell and Vaughn (1979) also conducted a study on calculator curriculum and mathematical achievement and retention. They hypothesized that "There will be no significant difference between the experimental group and the comparison group with respect to achievement and retention (p.365)." Their sample consisted of a group of 38 above average high school students as a control group and a group of 33 above average high school students as an experimental group. The experimental group used calculators and specially designed curricula while the control group used the text adopted by the state and no calculators. The results showed that there was no significant difference between the groups concerning retention, but the experimental group using calculators and the specially designed curricula were able to achieve at a significantly higher rate.

Schnur and Lang (1976) conducted a study to determine if a group of students would achieve higher mathematical computational ability using the calculators than a group of students not using the calculators. The groups were randomly selected and the type

of instruction was identical for both groups except for the calculator usage in the experimental group. Both groups were administered pretests and posttests consisting of different forms of the Individualized Computational Skills Program Computational Test. Neither group was allowed to use calculators on either the pretest or the posttest, yet the experimental group which did use calculators in class gained significantly more computational ability than the control group which did not use the calculators in class.

Wheatley's (1980) study was concerned with calculator usage and improved problem solving performance. She theorized that problem solving has four main parts. These parts include understanding the problem to be solved, developing a plan for solving the problem, executing that plan, and evaluating the work. She felt that if the third part of the process were to be alleviated, then the problem solving performance would improve. Since this step in the process is the computational part of problem solving, her approach dealt with increasing calculator usage. She conducted 13 studies to research her theory and the results verified her hypothesis. In nine of her studies the group which used the calculators showed significantly higher achievement, in three of the studies there was no significant difference in achievement, and in one study the group not using the calculators showed higher achievement. Her studies also showed that, on the average, the non-calculator group commited 2.5 times as many errors in the computation than did the group using calculators.

Obviously, the controversy over the use or nonuse of calculators in the mathematics classes will continue. As yet there is

no clear cut answer to the question. But the studies have made some conclusions which seem to be generally accepted. The use of calculators in mathematics classes prior to the junior high school level is ill-advised since the students are still learning the basics. Secondly, the use of calculators for the students of below average ability is again not recommended for similar reasons as well as the apparent ineffectiveness of calculators as a learning aid. Finally, the use of calculators improves the student's ability to logically plan an approach to the solution of a problem. Once a student understands the calculator and how it works he is able to apply this knowledge to problem solving.

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